



# CORPORATE BROCHURE

ENERGY | ENGINEERING | SOLUTIONS




## Our Business

33

 years in business



5

 operational bases serving 18 active markets



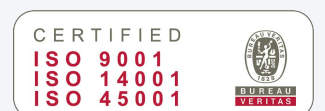
6,000+

 experts



## Our Partners

CR3 has established long-term alliances with a number of key strategic partners. This collaborative approach ensures our customers always benefit from having access to the most appropriate tools and technologies on any given project. We recognise our industry is constantly evolving. That's why we are continuously looking to expand our network of strategic alliance partners.





# Bolting, Flange Management & Machining



## YOUR CHALLENGES

Assuring the integrity of bolted joints is a major concern, particularly when they can involve the release of hazardous and harmful inventories to atmosphere. Avoidance of leaks is a top priority for operators, as they can lead to delayed production, unplanned shutdowns, and process safety incidents. When leaks do occur, they can often be very costly for all stakeholders.

## OUR BOLTING SOLUTIONS

CR3 provides safe, effective and efficient bolting, flange management and onsite machining solutions to prevent leaks in flanged assemblies. Our Joint Integrity Management teams inspect, maintain and record all bolted joints to assure you they are appropriately designed, specified, and tightened in accordance with ASME PCC-1 standards to ensure zero leaks. Our multi-skilled and fully certified field service engineers will help you reduce numbers on site, ensuring one contractor is able to support all your project needs from start to finish, saving time and cost.

## HOW WE SUPPORT YOUR BUSINESS

CR3's experienced field service engineers and specialist equipment can support all your bolting requirements. We complement our in-house expertise through partnerships with other market-leading organisations including Enerpac (formerly Hydratight) and LAPP for bolting, flange management and onsite machining equipment and training.

We offer a comprehensive range of torqueing services, providing the required accuracy and consistency necessary for safe, reliable and leak-free bolted-joint assemblies. Ensure joint integrity and prevent unnecessary leaks with our wide variety of bolt tensioning applications. Our flange management software offers superior traceability and reporting for computing bolt loads and tooling pressures on a wide range of flanged joints and clamped connections. We offer a vast array of portable machines for turning, drilling, milling and grinding at your site, significantly reducing downtime and cost.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading one-stop provider of specialised maintenance services.

### Advanced equipment and technology

Our integrity data management software is fully ISO 27001 certified and SSAE16 compliant and provides superior traceability and reporting on materials of construction, assembly, bolt loads, maintenance history, and supplementary documentation to be recorded and retrieved at any time during the project life-cycle.

We provide onsite repairs and refurbishment of flange faces up to 120 inches in diameter and have access to a full array of 2-axis and 3-axis milling machines along with bolt extraction and thread refurbishment machines for removal of snapped or seized studs.



### Outstanding QHSE performance

safety training is current and relevant, we closely monitor changes in regulations or recommended practices and incorporate these improvements into the training courses.

safety training is current and relevant, we closely monitor changes in regulations or recommended practices and incorporate these improvements into the training courses.

### Unrivalled experience

With experience in providing onsite repair and refurbishment services and with advanced flange management software that allows you to compute, update and track all relevant information quickly and effectively, we are ready to support you on any job, large or small.

We have a wealth of experience with these critical techniques and have suitable equipment to cope with a wide variety of applications. Our highly experienced personnel can ensure joint integrity and prevent unnecessary leaks.

### Exceptional service

We complement our in-house expertise through partnerships with other market-leading organisations including Enerpac (formerly Hydratight) and LAPP for bolting, flange management and onsite machining equipment and training.

Our commitment to service excellence is backed by our track record of integrated management systems that are certified to multiple international standards.

## OUR SOLUTIONS

- Onsite machining
- Flange facing
- Gasket surface machining
- Grinding and turning
- Pipe cutting and bevelling
- Orbital milling
- Counter boring
- Flange management services
- Joint integrity management
- Controlled bolting
- Hand torqueing
- Hydraulic bolt torqueing
- Hydraulic bolt tensioning

## YOUR BUSINESS BENEFITS

**Benefit from a holistic approach** – that eliminates the need to manage multiple contractors on site over the course of your project.

**Save time and money** – our multi-skilled and fully certified field service engineers will help you reduce numbers on site, ensuring one contractor is able to support all your project needs from start to finish.

**Ensure high safety standards** – by working with a partner that is committed to delivering the highest safety standards in the industry.

## CR3 IN ACTION

### The challenge

Several large flanges and an 88" slide valve were damaged during the construction of a refinery in SE Asia requiring onsite machining.

### The solution

CR3 quickly mobilised our large portable 45-120 inch flange facing machine to execute the repairs saving time and significant cost over the other options.

### The outcome

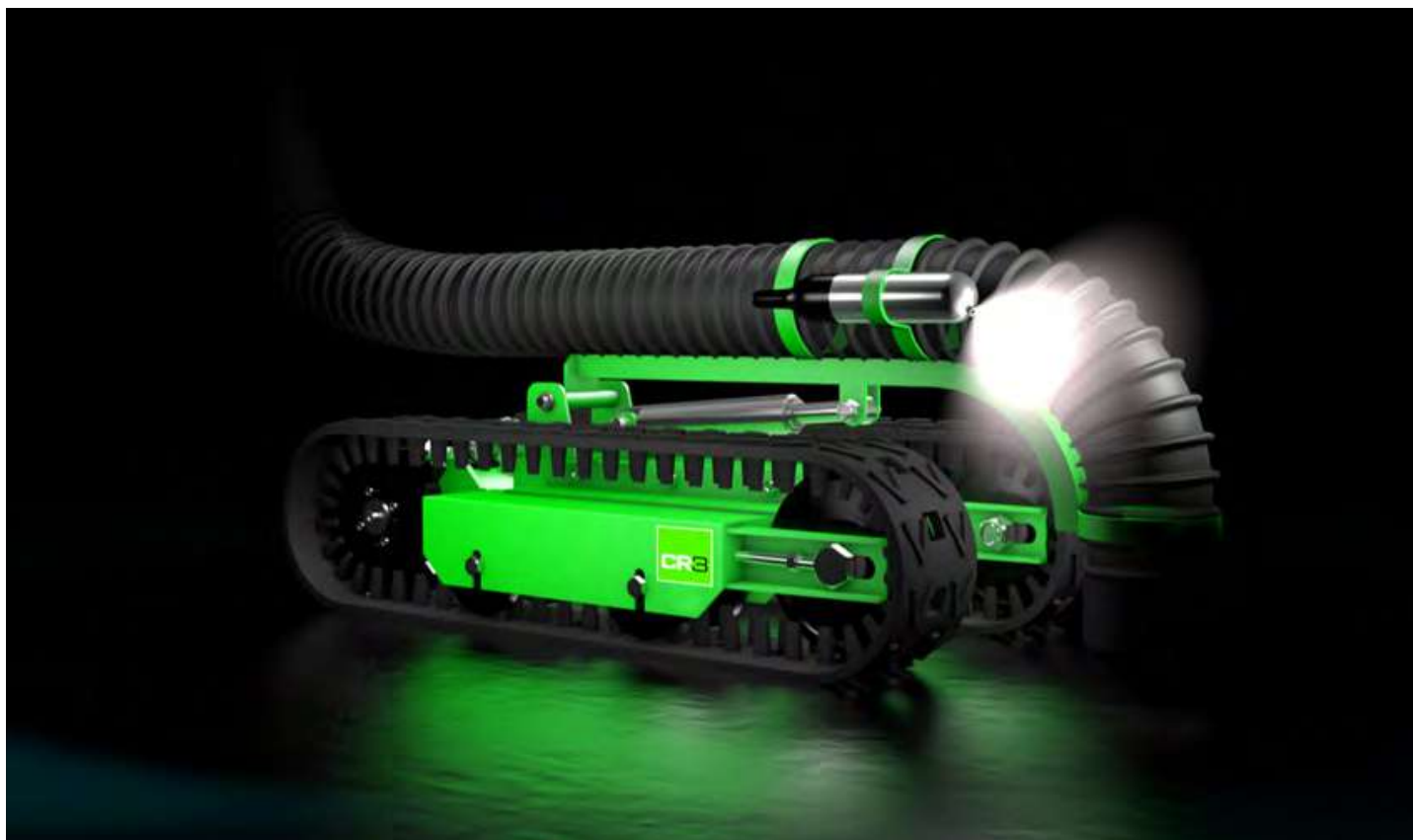
The flanges were machined to ASME standards, meeting all integrity testing requirements first time. The client appreciated our efficient and safe execution of the work.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy Efficiency, Engineering Excellence, and Sustainable Solutions.**

**To learn more, visit [CR3.Group](https://www.cr3group.com)**



# Catalyst Handling Services



## YOUR CHALLENGES

Owners and operators of refineries and petrochemical plants need to ensure the highest levels of safety and efficiency when charging and discharging reactors. This is a critical job that requires highly skilled contractors, especially for complex or high-risk change-outs. For example, pyrophoric catalysts require specific handling techniques under inert (nitrogen) atmospheres. Catalyst vendors frequently recommend using specialist contractors to ensure materials are handled appropriately and to safeguard their performance guarantees. Over the years, CR3 has developed excellent working relationships with all major catalyst vendors.

## OUR CATALYST HANDLING SERVICES

CR3 has a long history of providing superior services for the unloading and loading of catalyst for both fixed-bed and tubular reactors throughout Asia. Our services support

catalyst handling on all reactor types, including mechanical work on internals for removal and re-installation if required.

## HOW WE SUPPORT YOUR BUSINESS

CR3 adopts a 'blind to blind' approach that minimises cost and downtime for your business. Depending on the type of reactor, catalyst or process involved, our experts customise a solution to your needs by applying different methods for unloading and loading your reactors.

In addition to providing highly trained, service-oriented personnel, we support your business with a complete range of advanced equipment including 'Rover' (our remotely operated vehicle) for unloading reactors, lockable helmets for improved safety and innovative vacuum systems for greater efficiency. In accordance with our commitment to service excellence, we are continually developing and assessing improved technologies and processes for inert and non-inert entries and non-entry catalyst handling.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading one-stop provider of specialised maintenance services.

### Innovative equipment and techniques

Our state-of-the-art catalyst technologies redefine safety standards while increasing efficiencies. For unloading, 'Rover' (our robotic solution) minimises exposure to hazardous environments and our Eco-Hydrodrilling process is effective for heavily fused catalysts. When loading, our automatic four-drum tipper saves significant time over manual handling, CR3's Dense Loader boosts reactor performance through better catalyst distribution and Soft-Flow (our pneumatic loading technique) is more efficient than conventional loading by eliminating the use of cranes.

### Outstanding QHSE performance

We pride ourselves on maintaining an unblemished track record for quality and safety. Every technician is accredited under our confined space and inert entry training courses and our technicians will readily produce their training records for verification upon request. CR3's lockable helmets incorporate a breathing mask and built-in headset for communicating with team members to ensure the safest experience under the toughest of conditions.

### Unrivalled experience

With a 25-year track record of successful project delivery and certification letters in place with all major catalyst vendors, CR3 is regarded as the region's foremost catalyst handling expert. Our teams possess a wealth of experience when it comes to complex jobs involving Parex, FCC and CCR units. The term contracts we have with the likes of Shell, ExxonMobil, ConocoPhillips and PETRONAS are a testament to our competence and professionalism.

## Exceptional service

Choosing us as your single source to perform the full scope of catalyst handling services – isolating and opening the reactor, emptying and re-loading contents, closing the reactor and de-blinding or de-isolating it to save on standby time – ensures streamlined project delivery with simplified management and administration.

## OUR SOLUTIONS

- Inert entry (N<sub>2</sub>) – for catalyst unloading / reloading as well as other applications
- Dense loading – Densicat technology under license from Petroval (Total)
- Dense loading – Calydens technology under license from Crealyst
- Dense loading – technology under license from UOP (USA)
- Unidense – loading technology for reformer tubes under license from Unidense Technology GmbH
- Catalyst screening – under inert and normal atmosphere conditions
- Reactor internals – removal, reinstatement, video inspection, repair, modification, upgrade and passivation
- Reformers (furnace) – total service including tube changing / welding and uniform loading
- Reformers (furnace) – total service including tube changing / welding and uniform loading
- Reformers / Platformers – catalyst change-out and mechanical work
- Ammonia converters – total service including basket changes
- CCR – total service including centre pipe and scallop removal, repair, welding and replacement
- ARHDM & RDS – hydrodrilling technology for coked / fused reactors
- HCU – total service including repair, soda ash washing, welding and dense loading
- Parex – Molex – Olex chambers – adsorbent change-out and mechanical work
- Tubular reactors – catalyst change-out, tube cleaning & Dp measurement
- FCC – catalyst vacuuming and coke removal

## YOUR BUSINESS BENEFITS

**Benefit from a one-stop solution** – that encompasses all mechanical and repair work in addition to unloading and re-loading the catalysts in all types of reactors.

**Maintain high safety standards** – by choosing a partner with a proven commitment to ensuring a safer workplace, both onshore and offshore, in normal and inert atmosphere conditions.

**Save time and money** – with an experienced catalyst handling expert that can support your operations through a comprehensive 'blind to blind' approach.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy Efficiency, Engineering Excellence, and Sustainable Solutions.**

**To learn more, visit CR3.Group**

## CR3 IN ACTION

### The challenge

A refiner needed to change its Parex adsorbent at the end of its useful life to boost production efficiencies and improve yields.

### The solution

Having performed over 25 Parex re-loads throughout the region, CR3 replaced the adsorbent and all reactor internals within 27 days, setting a new record.

### The outcome

The client generated significant savings by putting the unit back in service earlier compared with typical re-load durations.



# Chemical Cleaning Services



## YOUR CHALLENGES

When physical access is not possible, chemical cleaning is the preferred method for removing undesirable substances from polluted surfaces. Chemical cleaning covers a wide range of applications, from new construction to ongoing maintenance activities. Selecting the right chemical cleaning process is governed by a wide variety of factors – safety, effectiveness, corrosion rate, treatability of the effluent, disposal options, required heat input, local availability of chemicals, availability of the required utilities and cost.

## OUR CHEMICAL CLEANING SERVICES

With unrivalled experience in this field, CR3 can recommend the most suitable solution for your specific needs. Our chemical cleaning services fall into three categories:

- Process cleaning removes pollutants caused by operating processes such as waterborne scale, excess magnetite, cuprous oxide, polynuclear aromatics, iron sulphide, heavy tar and others.

- Pre-commissioning cleaning prepares newly installed piping and equipment for its intended purpose. This covers the removal of loose and potentially loose matter while retaining the passivation of metal surfaces that require corrosion-resistant properties. As part of this process, we also perform (hot) oil-flushing as well as steam- and air-blowing.
- Decontamination or de-gassing for the elimination of explosive gases (L.E.L.), H<sub>2</sub>S, Hg, benzene and pyrophoric material for plant shutdown.

## HOW WE SUPPORT YOUR BUSINESS

CR3 offers complete chemical cleaning solutions. Our holistic approach includes safety management, all mechanical work, engineering, custom-made equipment operated by skilled staff, on-site analysis, hydro-jetting, joint integrity management with controlled bolting, leak testing and on-site wastewater treatment. As part of our commitment to service excellence, we take into account all aspects of the chemical cleaning process driven by safety and the environment, quality, scheduling and cost efficiency.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading one-stop provider of specialised maintenance services.



## Innovative technology

CR3, in collaboration with technology partners and suppliers, has developed a number of proprietary products to, for example, combat mercury and polynuclear aromatics. We have also developed water-based products utilising the extraordinary properties of dipentene and amine oxides, amongst others. For pre-commission cleaning of relocated plants, we combine hydrostatic testing of piping and heat exchangers. This cost-saving practice has been successfully applied at relocated EDC/VCM and ammonia plants and refineries.

## Stringent QHSE processes

Every evaluation begins with an unwavering focus on ensuring the safety of people, property and the environment. The choice of chemicals is paramount in this respect. We always pay close attention to handling safety, corrosion rates, process safety, emissions and wastewater treatability.

## YOUR BUSINESS BENEFITS

**Benefit from a holistic approach** – that combines mechanical services with cleaning and testing.

**Minimise environmental impact** – with industry-leading cleaning processes that utilise non-toxic biodegradable chemicals. Our approach minimises emissions and enables wastewater to be treated onsite in accordance with the most stringent environmental standards.

**Save time and costs** – through our in-depth familiarity of all issues related to chemical cleaning and our ability to deploy world-class solutions via local resources quickly and cost effectively.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy Efficiency**, **Engineering Excellence**, and Sustainable **Solutions**.

**To learn more, visit CR3.Group**

## Unrivalled experience

CR3 offers holistic packages that carry the best practices and experiences gained in one discipline over to the next. Since 1991, we have successfully performed over 1,000 chemical cleaning projects involving power station boilers, heat recovery steam generators, waste heat boilers (Compac Unit), hydraulic & lube oil systems, shell & tube heat exchangers, plate & frame heat exchangers, printed circuit heat exchangers, plate bundle and Texas tower CFE, cooling water jackets & systems, condensers & fin fans, urea strippers, slug catchers and stainless steel systems (ASTM A-380).

## Exceptional service

As the region's leading multidisciplinary service provider, CR3 knows the complete production process better than anyone. We also understand the challenges our customers face. So, for example, when we take up a platformer unit, our solution encompasses catalyst handling, cleaning of air preheaters, cleaning of combined feed/effluent heat exchanger and cleaning of fin fans.

## OUR SOLUTIONS

- Pre-commissioning cleaning in the power and process industries combined with oil-flushing
- Chemical cleaning of power station and utility boilers Plant decontamination (de-gassing)
- Mercury decontamination
- Chemical cleaning of all types of heat exchangers
- Slug catcher cleaning and servicing

## CR3 IN ACTION

### The challenge

A refiner in Southeast Asia was experiencing an unacceptably high Hot Approach Temperature (HAT) of the Combined Feed / Effluent Heat Exchanger in the platformer unit. The lack of efficiency appeared to be caused primarily by polynuclear aromatics and magnetite.

### The solution

CR3 applied a multistep chemical cleaning process that involved the circulation of various aqueous chemical mixtures, ensuring a positive pressure at the feed side at all times.

### The outcome

The HAT dropped from 54°C to 40°C with a total cleaning time of less than four shifts.



# Chemical Decontamination Services



## YOUR CHALLENGES

Chemical decontamination is the preferred method for removing undesirable and harmful contaminants from process equipment. To maximise efficiencies and eliminate delays in vessel entry and mechanical works, operators want to minimise the time taken to prepare the equipment for both decontaminating and cleaning. Selecting the right chemical decontamination process is governed by a wide variety of factors – safety, effectiveness, treatability of the effluent, disposal options, local availability of chemicals, ability of mechanical support team and cost.

## OUR CHEMICAL DECONTAMINATION

CR3 has partnered with Zyme-Flow® Decon Technology for over 15 years to provide the most suitable decontamination solution for your specific requirements. Together, we greatly shorten the time taken to make equipment safe in preparation for periodic maintenance and inspection routines which has a significant impact on reducing the overall duration of turnarounds and shutdowns.

Our chemical decontamination services fall into two categories:

- Organic solvent cleaning process which targets heavy hydrocarbon such as Vacuum Tower Bottom (VTB), Visbreaker (VB) Bottom, Asphalt and heavy tar to minimise post-decontamination cleaning significantly.
- One-step decontamination process or de-gassing for the elimination of residual oil, explosive gases (LEL), hydrogen sulfide (H<sub>2</sub>S), benzene and pyrophoric iron sulfide (FeS) for plant maintenance/hot works requirement.

## HOW WE SUPPORT YOUR BUSINESS

Our holistic approach includes safety management, mechanical work, engineering, custom-made equipment operated by skilled staff, on-site analysis, integrity management with controlled bolting, leak testing and on-site waste management. We consider all aspects of the chemical decontamination process driven by safety and the environment, quality, scheduling and cost-efficiency.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading one-stop provider of specialised maintenance services.

### Integrated solutions

We have an experienced mechanical team and the expertise to fabricate, supply and proficiently set up mechanical manifolds required in decontamination according to site standards. As the region's leading multidisciplinary service provider, we can manage the entire project ensuring the most comprehensive solutions for our clients.



### Innovative chemistries

Our range of products target various contaminants found in process systems. Zyme-Flow's single step Vapor-Phase process eliminates LELs, H<sub>2</sub>S, Benzene, pyrophoric FeS as well as Ammonia. For heavy hydrocarbon systems, an organic solvent is used as part of a typical shutdown process to enhance the dissolution of heavy hydrocarbon and significantly reduce the mechanical cleaning duration.

## YOUR BUSINESS BENEFITS

**Benefit from an integrated solution** – that encompasses all mechanical works, engineering, fabrication and on-site modifications in addition to chemical decontamination.

**Minimise environmental impact** – with industry-leading chemistries and processes that utilise non-toxic biodegradable chemicals. Our approach minimises emissions and enables wastewater to be treated onsite in accordance with the most stringent environmental standards.

**Save time and costs** – by minimising manual and mechanical cleaning which has a significant impact on reducing the overall duration of turnarounds and shutdowns.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy Efficiency**, **Engineering Excellence**, and Sustainable **Solutions**.

**To learn more, visit CR3.Group**

## Exceptional service

CR3 provides the industry's most comprehensive preproject planning services, which include:

- Extensive consultation with refinery personnel and on-site inspection of all equipment and piping
- Detailed procedures, including chemical injection points, tagging, fluid volumes and all necessary preparations
- Comprehensive plan with safety and environmental priority
- Drawing options including marked-up PFD's or Blue beam
- Timeline/schedule
- Decontamination procedure integrated into operation shutdown procedure
- Operator training of decontamination procedure

## Stringent QHSE processes

We always pay close attention to handling safety, corrosion rates, process safety, emissions and wastewater treatability. CEFAS and REACH compliant, we meet the most stringent environmental standards.

## OUR SOLUTIONS

### DECONTAMINATION

- Chemical decontamination of hydrocarbons and pyrophoric material
- Specialised flushing of heavy hydrocarbon bottom circuits
- Online heat exchanger chemical cleaning
- Reactor cleaning
- Waste management
- Lab analysis of contaminants and chemical treatments

### MECHANICAL SERVICES

- Engineering and fabrication
- On-site modification and set-up
- Joint integrity management
- Specialised equipment

## CR3 IN ACTION

### The challenge

A refiner in Thailand required extensive decontamination works as well as waste management of the effluent to ensure an efficient handover for maintenance works during a large revamp and turnaround event.

### The solution

CR3 supported the entire project from engineering and planning to site preparation and set up of decontamination drainage manifold for waste management and execution.

### The outcome

Our comprehensive approach saved significant time, minimised mechanical cleaning and met all the KPI's for LELs, H<sub>2</sub>S, Benzene and eliminated any pyrophoric events ahead of schedule.

# CR3

## Cold Cutting



### YOUR CHALLENGES

It is frequently necessary to make precise cuts through structures, equipment and pipelines to facilitate projects such as adding new facilities, improving or repairing existing ones or even decommissioning redundant installations.

Often, due to the presence of residual hydrocarbons or to avoid hazardous emissions, we understand the need to use cold cutting techniques for these incisions to eliminate safety concerns and improve quality and cost control.

### OUR COLD CUTTING

CR3 has extensive experience of performing precise and controlled cuts, using a variety of methods, at all stages of the project life-cycle from construction through to final demolishing of retired equipment. We provide several specialist cutting techniques to suit every situation.

### HOW WE SUPPORT YOUR BUSINESS

We have portable clamshell cutting equipment to cut pipework both offshore and onshore. This technique is particularly useful for existing facilities where residual hydrocarbons are likely to be present in the item to be cut.

Our hydro-abrasive cutting is a perfect cutting medium for large and small objects. This combination of ultra-high pressure water and garnets is mostly used for cutting vessel heads, tank bottoms, man-ways as well as access doors and will cut cleanly through refractory lined structures.

While our diamond wire cutting is mostly used in confined spaces and for slicing through contaminated objects to minimise harmful emissions. Hence, it is commonly deployed for the controlled demolition of buildings, structures and equipment.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading one-stop provider of specialised maintenance services.

### Innovative equipment and techniques

Our patented track system for hydro-abrasive cutting guarantees a sharp, clean and precise cut each and every time. The track can be fabricated and rolled in any shape or length to ensure a quality cut is achieved, with or without in-situ weld preparation, in a single pass.

Our diamond wire cuts through all materials including rock, steel and concrete and even a combination of all three and is cooled by water to increase the life span of the wire.

The clamshell method can cut and bevel at the same time in a single pass, which increases the surface area of the cut or bevelled edge resulting in a stronger and more secure welded joint.

### Exceptional service

Our aim is to always deliver the best quality, whilst ensuring the project is completed within schedule, within budget and without incident. With our network of offices across Asia, we have the ability to respond quickly to planned and unplanned events.

### Outstanding QHSE performance

All of our cold cutting specialists are highly trained, hold a valid certificate and have significant field experience. Our quality and safety track record is maintained through structured training programmes, knowledge sharing, new processes and automated equipment that increases productivity while minimising the risk of injury.

## Unrivalled experience

We deliver your projects safely, on time and on budget by ensuring single-source control through our multi-disciplinary approach and project management capability. We provide several specialist cutting techniques to suit every situation and have completed some of the most challenging projects in Asia.



### OUR SOLUTIONS

- Cold cutting
- Clamshell cutting
- Pipe cutting and bevelling
- Hydro-abrasive cutting
- Ultra-high pressure water jet cutting
- Diamond wire cutting

## YOUR BUSINESS BENEFITS

**A variety of methods** – to suit every situation. We have extensive experience of performing precise and controlled cuts using a variety of methods at all stages of the project life-cycle.

**Save time and money** – by working as one team to ensure optimal safety, quality and schedule efficiency, we support you with detailed planning, coordination and execution for various cold cutting scopes.

**Improved safety and quality** – by ensuring single-source control through our multi-disciplinary approach and project management capability.

## CR3 IN ACTION

### The challenge

A mercury recovery operator needed to demolish old and redundant heat exchangers without inadvertently releasing mercury during the cutting process.

### The solution

CR3 used diamond wire to cut the metal with a specially fabricated rig with a remotely operated winch system and pulleys to move the heat exchanger into position for each cut preventing contact with equipment.

### The outcome

The diamond wire cold cutting technique made light work of the demolition and prevented inadvertent release of any mercury.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy Efficiency, Engineering Excellence, and Sustainable Solutions.**

**To learn more, visit [CR3.Group](#)**



# Column and Tower Internals



## YOUR CHALLENGES

Operators routinely elect to inspect, clean, replace and even upgrade the mass transfer internals in their columns and towers to satisfy ever-increasing production demands. In addition to deciding which type of internals to purchase, operators need to ensure the internals are properly installed so they receive the full benefit of the technology, as failure to do so can have a considerable impact on process safety, product quality and return on investment.

## OUR COLUMN AND TOWER INTERNALS

We provide the full range of services related to column and tower projects, including removal of internals, cleaning, installation of new or refurbished internals, column inspections, column modifications, and complete project management.

Our combination of applying the latest equipment and multiskilled technicians in a 'blind to blind' approach helps to minimise downtime and maximise returns.

Pre-engineering services such as planning, scheduling, coordination and logistics are standard practice in every one of our column projects to optimise resources, ensure safe execution and trouble-free start up. All related requirements, such as column decontamination, scaffolding, welding, cold cutting, (including Diamond wire), on-site machining and lifting are handled too. This all-inclusive approach enables us to take on and execute the total work scope without any interface issues, which improves safety and saves considerable time and cost.

## HOW WE SUPPORT YOUR BUSINESS

We support our customers with detailed estimates, plans, and procedures for executing any size of project. Our complete 'blind to blind' solution ensures more streamlined and efficient projects, as we maintain direct, exclusive control of all critical path elements. We complement our in-house expertise through strategic alliances with technology partners, so we can provide end-to-end solutions under a single contract, delivering significant savings in the process.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading one-stop provider of specialised maintenance services.

### Advanced equipment and technology

We continue to invest in the best equipment, systems and performance management tools to support our project delivery teams and remain at the leading edge of the industry.

We have a track record of bringing innovation to the market place, which is often obtained through information sharing with our shareholders and long-term technical partners such as Koch-Glitsch.

### Outstanding QHSE performance

Our comprehensive approach covering all aspects of the work from inspection to installation ensures we deliver optimal safety, quality and schedule efficiency.

We closely monitor regulations for any changes or new recommended practices and incorporate these improvements into our courses to ensure that our safety training is current and adheres to strict international standards.

### Exceptional service

We work collaboratively with our customers to deliver outcomes in an environment of trust and mutual respect. Count on us to provide a multi-skilled, competent and motivated team, supported by high quality systems, procedures and equipment to meet your ever-evolving requirements.

Our commitment to service excellence is underpinned by our integrated approach to safety, quality and the environment as well as our continual investment in developing our people and securing the latest technology available.



### Unrivalled experience

To date, we have successfully performed numerous column scopes on refineries and petrochemical facilities across the region and are uniquely positioned as one of the few companies with experience of delivering many simultaneous column jobs on the same complex and across multiple sites and territories at the same time.

## OUR SOLUTIONS

- Complete package of internals and installation (with Koch-Glitsch)
- Column and tower inspections
- Removal of all types of column and tower internals
- Cleaning of all types of column and tower internals
- Internal repairs to columns and towers
- Installation of all types of column and tower internals including structured packing, random packing, trays, and grids
- Erection and dismantling of scaffolding inside columns and towers
- Column and tower modifications

## YOUR BUSINESS BENEFITS

**Benefit from a holistic approach** – with more streamlined and efficient projects, as we maintain direct, exclusive control of all critical path elements.

**Save time and money** – by providing end-to-end solutions under a single contract, eliminating interface issues and delivering significant savings in the process.

**Maintain high safety standards** – by choosing a partner that continually invests in structured training programs, knowledge sharing and automated equipment to minimise risks.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy Efficiency**, **Engineering Excellence**, and Sustainable **Solutions**.

**To learn more, visit [CR3.Group](#)**

## CR3 IN ACTION

### The challenge

A refiner in SE Asia needed to replace the internals in nine columns to boost throughput and enhance separation. The columns needed to be replaced in a 37-day window.

### The solution

Internals were removed and replaced with high-performance internals. Existing support rings were modified to accommodate the design requirements.

### The outcome

All columns passed leak tests first time and the replacement was completed within the 37-days. The client achieved the desired throughput and efficiency gains.



# CR3 Decoking Technology



## YOUR CHALLENGES

A common by-product of industrial plant processes, the build-up of coke and scale in furnace tubings and pipelines is a widespread issue. As these deposits impact operational efficiency, cleaning the tubes thoroughly, quickly and safely the first time, every time, is a key concern. Traditionally, Steam Air Decoking (SAD) has been employed as the preferred cleaning method. There are, however, a number of drawbacks with SAD including the incomplete removal of coke, an increased risk of tube erosion, heat damage, potential fire hazards and environmental issues. SAD also involves longer shutdown times and decreased run lengths.

## OUR DECOKING SOLUTION

These issues can all be resolved with CR3 Decoking Technology (CDT). Proven to be a safe, efficient and cost-effective cleaning technology, CDT does not require high temperatures, high pressure or toxic chemicals. Instead, water is applied at a low pressure, typically 150 psi, to drive the pig along the tube so that metal studs can scrape all

the coke and scale loose. By permitting water to flow around the pig and through the cleaning studs, the loosened deposits are flushed ahead of the pig and into a collection tank. This process is repeated several times as the size of the pig is increased incrementally, removing more deposits with each run.

## HOW WE SUPPORT YOUR BUSINESS

A proprietary technology from CR3, the region's leading one-stop provider of specialised industrial services, CDT is designed specifically to remove all coke and scale deposits. CDT is typically used to clean furnace tubings and pipelines in Cokers, Cogeneration Units, RDS, VBU, Vacuum Heaters, Naphtha Heaters and Crude Heaters.

To complement our in-house capabilities, we work closely with Intelligent Pigging providers. Our strategic partners support us with ultrasonic technology to check the integrity of the furnace tubings and pipelines. As ultrasonic inspections are only possible when the tubes are completely clean, this approach guarantees all coke and scale is removed.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading one-stop provider of specialised maintenance services.

### Advanced equipment and technology

CR3 uses the best piggs in the business. To guarantee fast turnarounds, we ensure a wide range of types and sizes are available onsite. Our experts also have access to multiple single and double pumping units, depending on requirements, to clean two or more furnaces simultaneously. Throughout the cleaning process, a chart recorder reading is used to pinpoint both the pigg's location as well as any fouled areas. We also team up with specialist inspection companies to perform intelligent pigging to determine the remaining life of tubes to help optimise operation and maintenance of your furnaces.

### Outstanding QHSE track record

From the start of operations until today, we have never suffered an onsite accident. Our technicians undergo the industry's most rigorous training. By maintaining the highest standards of professionalism, communication and collaboration on every project, we receive consistently high customer satisfaction ratings.

### Unrivalled experience

CR3 has successfully performed more than 300 decoking projects across the region. By cascading this knowledge and

experience internally to our project technicians, we are able to maintain a large pool of pigging operators who are ready to deploy at a moment's notice. MCTN, HPCL, Reliance Industries, IOCL, ExxonMobil, Shell, Petronas, Formosa, PTTGC and Thai Oil are just some of the industry leaders that have contracted our cleaning services.

### Exceptional service

CR3 offers a complete 'blind to blind' approach that includes all mechanical services. As part of our comprehensive service offering, we also provide technical support and advice along with planning, scheduling and project management. To ensure smooth project delivery, strong working relationships are maintained with all the main inspection companies. Professionalism and service excellence are key aspects of the training regime our technicians undergo. To ensure minimal disruption and downtime, they are also trained to perform regular maintenance on our pigging processing units and are capable of troubleshooting any fault onsite.

## OUR SOLUTIONS

- Furnace / HRSG / pipeline decoking and descaling
- Furnace decoking for refineries
- Pipeline cleaning / descaling
- Checking the integrity of the furnace tubings and pipelines

## YOUR BUSINESS BENEFITS

**Minimise downtime and cost** – compared to SAD, as the CDT solution is proven to be faster and more effective, and is delivered by highly trained, service-oriented experts.

**Benefit from customised solutions** – as CDT works with any pigging system, enabling us to select the pigg best suited to your requirements and your facilities.

**Restore operational efficiency** – by completely removing all coke or scale from tubes. By using piggs of various sizes with different stud configurations and ensuring the optimum number of runs, we thoroughly clean tubes with reducers and changing diameters.

**Safeguard your plant and people** – as the CDT system is a safer, quicker and more environmentally friendly cleaning technology.

## CR3 IN ACTION

### The challenge

Tubing corrosion in a HRSG Cogen unit was causing frequent emergency shutdowns for bypassing repairs that resulted in significant downtime and huge production losses.

### The solution

The CDT solution virtually eliminated the need for unplanned maintenance.

### The outcome

After comparing our cleaning maintenance cost with the previously lost production, the client identified significant savings and awarded us with 2 x 5-year service contracts.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy Efficiency, Engineering Excellence, and Sustainable Solutions.**

**To learn more, visit CR3.Group**



## Fabrication & Plant Upgrade Services



### YOUR CHALLENGES

Whether you are planning to increase capacity, add a new process or simply modernise your plant, it is often necessary to team up with a reliable local partner who can support all phases of the project from engineering through to commissioning and ongoing maintenance.

### OUR FABRICATION & PLANT UPGRADE SERVICES

We have dedicated workshops for fabricating structural and carbon steels separate from stainless steel and special alloys, to avoid cross-contamination. Through constructability reviews, we can maximise the early installation of structures and new equipment pre-turnaround, whilst the facility is online, reducing schedules and peak numbers during the subsequent outage.

### HOW WE SUPPORT YOUR BUSINESS

We are experienced at providing comprehensive fabrication and plant upgrade projects and, together with our technical partners, can support clients with all aspects covering engineering, construction, commissioning and project management. Often these projects coincide with planned shutdowns and turnarounds, which we can undertake in addition to the fabrication and plant upgrade, improving safety, eliminating interface issues and minimising cost.

Our fabrication and plant upgrade teams are spread across the region and provide general mechanical and maintenance services to all our customers. They are qualified experts, with internationally recognised certifications and take pride in delivering our full range of services to the highest standards.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading one-stop provider of specialised maintenance services.



### Advanced equipment and technology

CR3 has unparalleled access to the latest equipment and technology from around the world ensuring our customers always benefit from the latest solutions and ways of working on any given project. Our Innovation Program provides an opportunity for all stakeholders to participate in our continuous improvement and drive enhanced safety, improved efficiency and productivity, support our sustainability aspirations and deliver increased value for all.

### Exceptional service

CR3 consistently delivers the highest standards of safety, efficiency, productivity and customer satisfaction. We optimise projects through meticulous planning, exceptional program management, proactive procurement, easy-to-use systems and an experienced and multi-skilled workforce.

## YOUR BUSINESS BENEFITS

**Increase productivity** – with our workflow management systems that improve transparency of available resources and allows us to track compliance with operational and contractual KPIs and assist in delivering significant productivity gains for our customers.

**Save time and money** – with our multi-disciplinary approach and project management capability that eliminates interface issues and minimises costs to deliver your projects safely, on time and on budget.

**Ensure high safety standards** – by working with a partner that offers regular training and safety awareness programs to maintain a strong safety focus and excellent safety culture.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy Efficiency**, **Engineering Excellence**, and Sustainable **Solutions**.

**To learn more, visit [CR3.Group](#)**

This can be further enhanced with our in-house scaffolding services to provide a suitable access solution to maximise utilisation by follow-on trades.

### Outstanding QHSE performance

Our investment in training, equipment and SMART systems combined with our focus on rigorous planning, preparation and execution of work ensures we can deliver a best-in-class performance that continually exceeds our clients' expectations for safety and quality.

### Unrivalled experience

Our teams of engineers, planners, procurement personnel and technicians combined with our regular investments in the latest equipment, tools and systems maintain our reputation as the region's leading provider of fabrication and plant upgrade services.

## OUR SOLUTIONS

- Basic and detailed engineering services via specialist partners
- Dismantling, demolishing and removal of redundant equipment and piping
- Fabrication, installation and modification of structural steel including platforms and structures
- Fabrication, installation and modification of all pipework and piping systems including stainless steel and special alloys
- Provide specialist support for construction / constructability reviews
- Scaffolding and installation of safe work platforms
- Specialist cold cutting methods including: Diamond Wire, high-pressure water and pneumatic clamshell sever & prep
- Lift studies, safe rigging and installation of equipment and piping systems in live plant
- Rotating equipment installation and alignment
- Non-destructive testing (NDT)
- Associated civil works
- Painting and protective coatings
- Insulation / refractory

## CR3 IN ACTION

### The challenge

Fabricate and install 140 tons of structural steel around live refinery in SE Asia, including 620 tie-ins, 27 new rotating and static equipment items and several km of new pipe.

### The solution

Separate carbon/structural steel & stainless steel/Hastelloy workshops were established to avoid cross contamination. Major temporary support structures were fabricated and installed to facilitate, the replacement of heavy equipment.

### The outcome

Reduced the turnaround duration substantially, as most of the major equipment was installed pre-event whilst the plant was online.



# Fin Fan Optimisation Services



## YOUR CHALLENGES

Air cooled heat exchangers (ACHE) are used extensively throughout the Oil, Gas, Refining, Chemical, Power and other heavy industries. As a potentially critical component of your production process, ACHE performance is essential. Under the motto 'We Deliver Cooling Capacity', CR3's comprehensive portfolio of maintenance, cleaning and advisory services supports your production processes by delivering sustained or enhanced ACHE performance.

## OUR FIN FAN OPTIMISATION SERVICES

Various factors can influence cooling capacity, with cleaning being just one of many potential solutions to improve ACHE performance. For this reason, our cleaning solutions are performed together with an elaborate monitoring programme that enables us to investigate the full spectrum of possible causes for reduced efficiency. We also provide monitoring and data analyses to document efficiency gains by measuring the air velocity, plenum pressure differential, temperature and energy consumption before and after cleaning.

## HOW WE SUPPORT YOUR BUSINESS

As part of our comprehensive consultative approach, we investigate all possible issues associated with ACHE efficiency including hot air recirculation; the condition of the plenum; fan performance; energy consumption of the fan drive; vibration and noise levels, etc. Once the situation has been fully assessed, our experts propose the necessary corrective actions to resolve all issues.

To restore ACHE cooling capacity, we clean the inside as well as the external tube surface. Depending on your specific requirements, CR3 employs a range of methods such as foam cleaning, mechanised hydro-jetting and soda blasting (dry-cleaning) for the external surface. We carry out internal tube cleaning by high-pressure water jetting using automated techniques such as tube lancing equipment (TLE). TLE cleaning with flexible lances and rotating nozzles is suitable for narrow platforms so that extensive scaffolding is not required. Chemical cleaning can be used to remove H<sub>2</sub>S, FeS and/or sticky pollutants that present challenges for hydro-jetting applications. Both methods enable us to achieve an optimal result in the shortest possible time while maintaining the highest safety standards.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading one-stop provider of specialised maintenance services.



## Innovative technology

We use TLE techniques to clean tube interiors safely and efficiently. For the external tube surface, soda blasting (dry cleaning) is performed online in 95 per cent of all cases. Working in cooperation with our technology partner, MCO Team B.V. from the Netherlands, new solutions are developed for those interested in permanent cleaning installations and online continuous performance monitoring.

## Stringent QHSE processes

CR3 has a proven ability to restore cooling capacity to original design levels through online cleaning alone, using non-

hazardous, environmentally friendly sodium bicarbonate, which is also used as a food ingredient in baking powder. Naturally, all local laws and regulations pertaining to the blasting process are adhered to.

## Unrivalled experience

Based on our extensive experience, we recognise that approximately 85 per cent of all heat transfer issues at ACHE arise from fouling of the outer surface of the tubes, where debris accumulates on and in between the fins. By using foam cleaning, mechanised hydro-jetting or (online) soda blasting (dry cleaning), we can confidently offer the best solution for 'Delivering Cooling Capacity'.

## Exceptional service

To ensure minimal downtime, the majority of our cleaning services are performed online and our team is capable of cleaning some 70m<sup>2</sup> per shift. We check all aspects of fin fan performance to ensure cooling capacity is delivered. By providing consultancy and monitoring support together with an array of cleaning options, CR3 offers a comprehensive service package.

## OUR SOLUTIONS

- Cleaning of the external tube surface by foam cleaning, mechanised hydro-jetting or soda blasting (dry cleaning)
- Online cleaning of the external tube surface for the majority of ACHE
- Cleaning of the internal tube surface with semi-automated lancing equipment (TLE technique)
- Monitoring and troubleshooting for performance enhancement

## YOUR BUSINESS BENEFITS

**Gain certainty** – by relying on tried and tested maintenance, cleaning and advisory services from CR3. We have an impressive track record of delivering sustained or enhanced ACHE performance over the course of hundreds of successful projects.

**Increase efficiency** – with fin fan optimisation services that provide excellent results and a high return on investment. Our comprehensive portfolio of online ACHE cleaning and monitoring services can help to minimise downtime from unplanned maintenance activities.

**Minimise environmental impact** – with our non-hazardous, environmentally friendly solutions. Beyond ensuring all relevant laws and regulations are adhered to, our experts can help you reduce your carbon footprint.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy** Efficiency, **Engineering** Excellence, and Sustainable **Solutions**. **To learn more, visit CR3.Group**

## CR3 IN ACTION

### The challenge

A refiner in Southeast Asia was being forced to perform frequent flaring due to reduced efficiency of the iC5 Fin-Fan Overhead Condensers.

### The solution

CR3 carried out online cleaning of the tube exterior by soda blasting in seven day-shifts.

### The outcome

Following cleaning, a 136 per cent improvement in average airflow was measured. This resulted in an increase of 4.1 MW and an iC5 reflux increase of 55 m<sup>3</sup>/hour.



# Flare Maintenance



## YOUR CHALLENGES

Flare systems play a vital role in protecting refineries and petrochemical facilities by enabling them to be depressurised in a safe and controlled manner following an upset or emergency.

Hence, making sure the flare system is well maintained and fully operational is a key priority for all operators, particularly with it being a last line of defence against a major incident.

## OUR FLARE MAINTENANCE

We have extensive experience of providing complete flare system revamps and maintenance services onshore and offshore including construction, erection, inspection, cleaning, repairs, flare tip replacements, guy wire tensioning, dismantling and complete project management. Our combination of applying the latest equipment and multi-skilled technicians in a 'blind to blind' turnkey approach helps to minimise downtime and maximise returns.

## HOW WE SUPPORT YOUR BUSINESS

In addition to having highly qualified rope access technicians (up to IRATA level 3), we provide drone inspections of flare systems and other inaccessible areas, like chimneys onshore and the airgap (between the underdeck and surface of the sea) on offshore platforms.

Drone inspections enhance safety by eliminating the risk to personnel normally tasked with such jobs and save significant time, resources and cost.

We have specialist structural engineering expertise for designing and certifying the latest lifting solutions. We can also work very close to online flares by using Hydro-shield technology, which provides a curtain of water, in the event of a live relieving case, to shield our technicians from the live flare and provide sufficient protection for them to retreat a safe distance before the flare lights.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading one-stop provider of specialised maintenance services.

### Innovative equipment and techniques

We continually invest in the latest tools and techniques to ensure we deliver optimal safety, quality and schedule efficiency.

Our Hydro-shield technology, which provides a curtain of water, in the event of a live relieving case, to shield our technicians from the live flare and provide sufficient protection for them to retreat a safe distance before the flare lights.

### Exceptional service

We minimise time and cost by having a multi-skilled workforce and a one-team approach that covers safety management, cleaning, inspection, structural engineering, heavy lifting, plus any repairs and all mechanical work.

Our strategic partnerships boost our in-house capabilities, enabling us to provide turnkey solutions that are fully integrated for any project. Together we can provide specialist lifting solutions for offshore flare tip replacements that avoid the use of helicopters and crane vessels, saving significant time and cost.

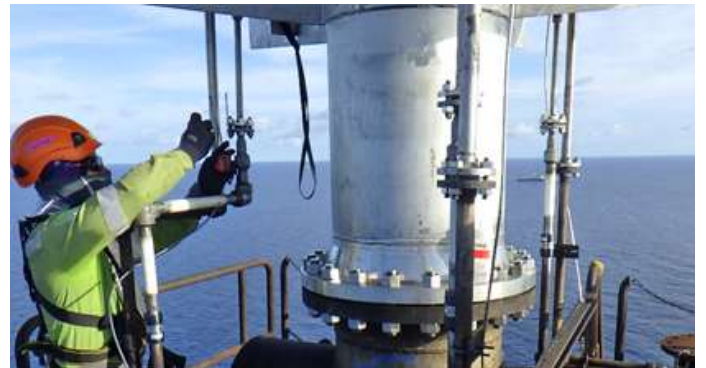
### Outstanding QHSE performance

Our quality and safety track record is maintained through structured training programmes, knowledge sharing, new processes and automated equipment that increases productivity while minimising the risk of injury.

Drone inspections enhance safety by eliminating the risk to personnel normally tasked with such jobs and save significant time, resources and cost.

### Unrivalled experience

To date, we have successfully performed numerous flare revamp and maintenance projects, both onshore and offshore, across the region and are uniquely positioned as one of the few companies capable of delivering multiple flare projects at the same time.



## OUR SOLUTIONS

- Flare tip replacement (onshore and offshore)
- Flare tip and ignition system maintenance and inspection
- Flare stack and riser construction, maintenance and inspection
- Flare derrick structure construction, maintenance and inspection
- Flare system revamps
- Heavy and special lifting equipment and associated structural engineering services (including winches, sheaves, crane block, gantry, etc.)
- Guy wire replacement, tensioning, maintenance and inspection
- Online flare maintenance (with Hydro-shield technology)

## YOUR BUSINESS BENEFITS

**Benefit from a holistic approach** – enabling us to provide turnkey solutions that are fully integrated for any project, of any size and make use of the most advanced technology available.

**Save time and money** – by having a multi-skilled workforce and a one-team approach that covers safety management, cleaning, inspection, structural engineering, heavy lifting, plus any repairs and all mechanical work.

**Enhanced safety and quality** – by continually investing in the latest tools and techniques to ensure we deliver optimal safety, quality and schedule efficiency.

## CR3 IN ACTION

### The challenge

A gas separation plant in SE Asia needed to perform the inspection and maintenance of a 115 m high demountable flare comprising of six sections weighing 15 tons each.

### The solution

In collaboration with Conbit, we provided special lifting equipment including hook blocks and sheaves to overhaul and load test the existing derrick 3 months before the shutdown to prove its integrity.

### The outcome

Using the existing derrick and winch system saved significant cost and time. The Client was able to flare again within regulatory stipulations.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy Efficiency, Engineering Excellence, and Sustainable Solutions.**

**To learn more, visit [CR3.Group](#)**

# CR3

## High-Pressure Water Jetting



### YOUR CHALLENGES

High pressure water jetting (HPWJ) or hydro-blasting is commonly used in the process industries for the penetration and removal of heavy deposits in process equipment. With the use of high pressure cleaning processes comes the risk of exposing workers to hazards with potential to cause serious injury.

### OUR HIGH PRESSURE WATER JETTING

CR3 can take care of all of your high pressure water jetting requirements. We have extensive experience of supporting clients with all manner of specialist hydro-blasting projects, irrespective of their size and scale, both onshore and offshore. With our commitment to continuous improvement combined with one of the largest and comprehensive ranges of automated and robotic equipment in the industry, we can assure you of optimal safety, quality and schedule efficiency on every job.

Working as one team, we support you with detailed planning, coordination and execution services. Our modern equipment along with our multi-skilled and highly trained technicians will help you reduce numbers on site, ensuring we can support all your projects from start to finish, saving time and cost. With our network of offices across Asia, we can respond quickly to any planned and unplanned events.

### HOW WE SUPPORT YOUR BUSINESS

We have invested in advanced automated technology, which removes the operator from the line of fire and makes the cleaning process substantially faster and more efficient. With minimised risk to personnel, we can use much higher flows and pressures to significantly improve productivity and quality. Our extensive fleet of high pressure pumps delivering pressures and flows up to 2,800 bar and 250 litres / minute respectively, plus our range of nozzles, drilling attachments and lances, enable us to effectively meet all your plant needs.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading one-stop provider of specialised maintenance services.

## Innovative equipment and techniques

Our specialised equipment includes automated internal and outside bundle cleaners, automated Roto-clean pipeline and insitu tube cleaners, automated 3D tank cleaning heads, automated tube lancing equipment (TLE) for controlled cleaning of vertical tubes, automated ultra-high pressure water cutting tools and remote control multi-purpose tracked robots for working in all conditions and eliminating man-entry.

## Outstanding QHSE performance

Our continual investment in the latest automated and robotic equipment ensures we can perform the cleaning task from the safety of a control cabin or a good distance away from the cleaning area. This is inherently safer than conventional techniques, which encourage workers to get too close to the high pressure water jets, exposing them to significant hazards and the potential for serious injury.

## Unrivalled experience

The use of advanced cleaning methods has enhanced our reputation for helping customers increase safety and efficiency. In addition, our use of rigid lances over traditional flexible ones has enabled higher water pressures and flows to be used, resulting in significant improvements in cleaning quality and productivity gains for our clients.

## Exceptional service

By utilising a combination of high pressure water, steam, chemicals and specialised accessories, we can clean surfaces

otherwise impossible to clean by conventional means. These include pipeline internals, vessels, columns, reactor/exchanger tubes and tanks. Heavy deposits of scale or chemical residue can be efficiently removed, thereby reducing cleaning duration.

## OUR SOLUTIONS

- High pressure and ultra-high pressure pumps to 2,800 bar
- Fully automated inside and outside heat exchanger bundle cleaning system
- Full 'blind to blind' service including mechanical preparation, tube bundle pulling and re-tubing
- Roto-clean high pressure water pipeline cleaning system
- High pressure water surface cleaning for floors and grating
- High pressure water surface preparation for coatings and inspection
- High pressure water automated cleaning system for reactors and tanks
- High pressure water jet cutting of concrete, refractory and steel
- Drain and sewer cleaning systems with simultaneous vacuuming
- Liquid and solid vacuuming and collection systems
- Automated tube lancing equipment (TLE) cleaners
- Full turnaround and shutdown services on a 'blind to blind' basis



## YOUR BUSINESS BENEFITS

**Benefit from a holistic approach** – by having a single point of contact we can support your project from start to finish including planning, execution, commissioning and project management, minimising the number of contracts required and eliminating interface issues.

**Save time and money** – by using advanced hydro-blasting technology that is safer, more efficient and superior in quality than conventional approaches.

**Ensure high safety standards** – by working with a partner that is committed to delivering the highest safety standards in the industry and further strengthened by our active membership of the AUSJET water jetting association.

## CR3 IN ACTION

### The challenge

A refiner in SE Asia required the urgent removal of heavy coke inside an RFCC unit with high temperatures and benzene concentration while ensuring the integrity of the refractory lining.

### The solution

Using our automated High Pressure Water Jet (HPWJ) equipment in tandem with fully rotational tank cleaning heads, we remove almost 250 tons of coke buildup.

### The outcome

Our advanced automated HPWJ equipment virtually eliminated the need for vessel entry and enabled the coke to be removed quickly, safely and efficiently without affecting the refractory lining.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy Efficiency**, **Engineering Excellence**, and Sustainable **Solutions**.

**To learn more, visit CR3.Group**



# Insulation Services



## YOUR CHALLENGES

Insulation plays a critical role in maintaining the desired temperature of process streams and conserving energy. Knowing which type and quantity of insulation to use for a particular duty, how to apply, monitor and, when necessary, replace it in the right way and at the right time, is essential for achieving maximum efficiencies and savings.

It is important to periodically check the condition of your insulation, particularly under cladding, and repair or replace any defective sections, as appropriate, to remain energy efficient and minimise costs.

## OUR INSULATION SERVICES

CR3 supplies and applies all types of insulation to meet any process requirement including, hot insulation, cold insulation, dual insulation, personal protection, cost-in-situ, acoustic insulation, LNG insulation and wrapping/coating. We have extensive experience of planning, managing, and

executing such projects including the removal and reinstatement of insulation for maintenance activities on equipment during shutdowns and turnarounds. Our highly trained experts have all the necessary equipment and tools to apply, repair and remove insulation safely and effectively across all industries.

## HOW WE SUPPORT YOUR BUSINESS

We source the best quality materials through our network of approved vendors who are carefully screened and audited to ensure full compliance with our exacting product stewardship and delivery requirements.

We provide safe, reliable, and high-quality insulation services that deliver significant returns and are available to respond quickly to any planned or unplanned events. We minimise schedules and cost by investing in the latest tools and techniques and through our one-team approach to all aspects of the job.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading one-stop provider of specialised maintenance services



## Advanced equipment and technology

We have a track record of bringing innovation to the market place. With a global network of resources through our strategic alliances, we have unparalleled access to the latest equipment and technology from around the world. This collaborative approach ensures our customers always benefit from having access to the latest solutions and ways of working on any given project.

## Unrivalled experience

We conserve energy with our environmentally friendly insulation products that meet the toughest standards in the industry and support you with detailed planning, coordination, and execution for any size of project. You can rest assured that all our insulation specialists are highly trained, hold valid certificates and have significant field experience.

## YOUR BUSINESS BENEFITS

**Benefit from a holistic approach** – with our one-team approach to all aspects of the job along with our latest tools and techniques, to minimise schedules and costs.

**Optimise efficiency and profitability** – with our safe, reliable, and high-quality insulation services that deliver significant returns.

**Ensure high safety standards** – with insulation specialists that are highly trained, hold valid certificates and have significant field experience.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy Efficiency, Engineering Excellence, and Sustainable Solutions.**

**To learn more, visit CR3.Group**

## Outstanding QHSE performance

We are committed to our staff and their welfare, and providing a safe workplace is our highest priority. We provide significant resources to ensure all staff have the best training available in the industry. Our experts not only have all the necessary equipment and tools to apply, repair and remove insulation safely, they are also highly trained to minimise risks.

## Exceptional service

We aim to always deliver the best quality service, whilst ensuring the project is completed within schedule, within budget and without incident.

We work with all the main types of insulation material including:

- Fibreglass
- Mineral wool
- Cellulose
- Natural fibres
- Polystyrene
- Polyisocyanurate
- Polyurethane
- Vermiculite and perlite
- Phenolic foam
- Insulation facings
- Hot Tape / cold tape
- Nitrile rubber

## OUR SOLUTIONS

- Site monitoring and assessment of insulation requirements
- Practical advice including engineering design and work methodology
- Supply of insulation material (all types)
- Application of insulation material (all types)
- Removal and disposal of insulation / cladding materials (all types)
- Fabrication and installation of cladding
- Supply of multi-skilled manpower

## CR3 IN ACTION

### The challenge

Amidst strong winds, a refiner in South Asia needed to replace the insulation on a polypropylene pipeline stretching several kilometres along an offshore jetty.

### The solution

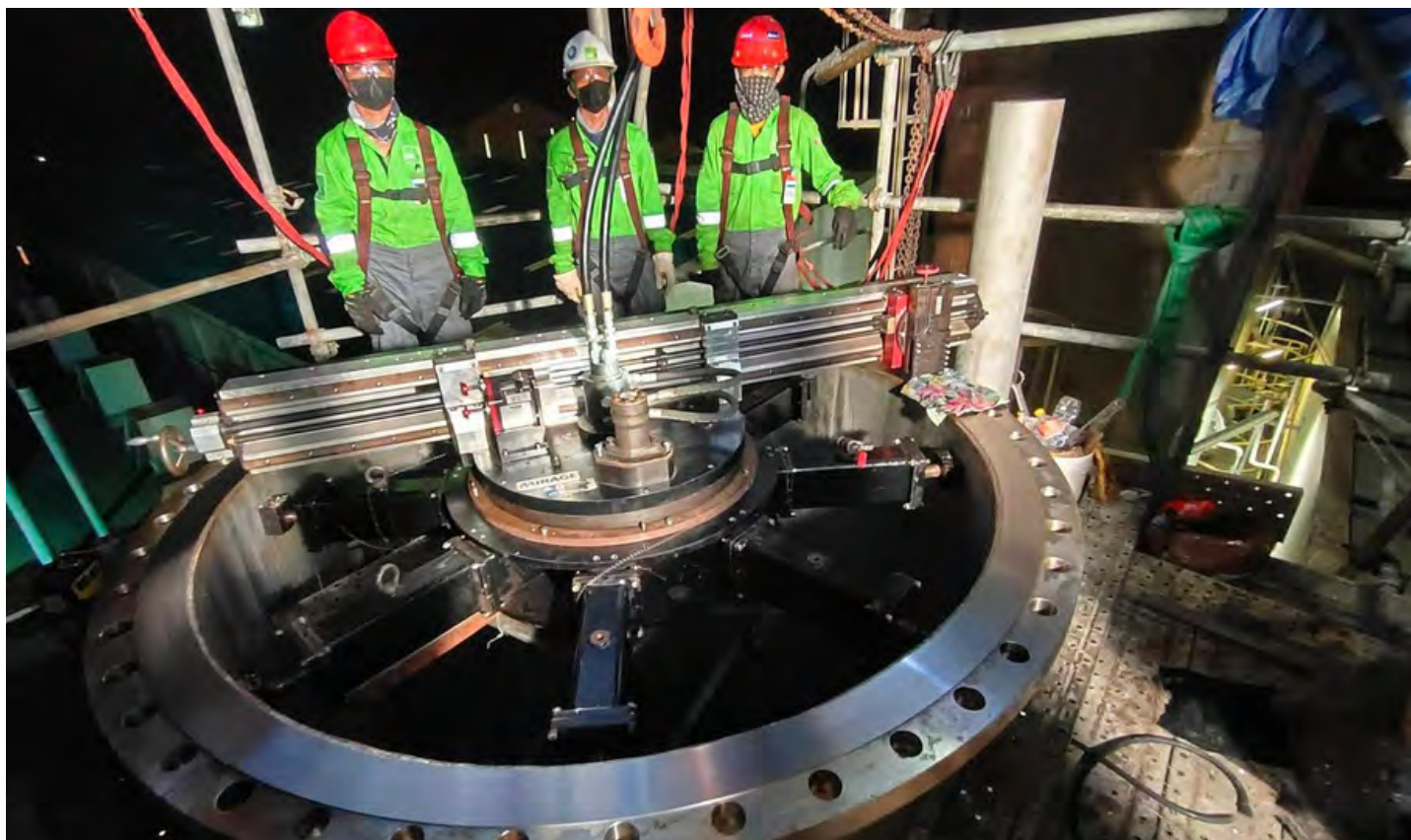
By setting up a series of staging platforms with netting protection we prevented drops and items from blowing off.

### The outcome

The specialist team safely removed and replaced the insulation with zero dropped items and no environmental contamination. All redundant materials were bagged and removed back onshore for subsequent disposal.



# Mechanical Services



## YOUR CHALLENGES

Faced with increasing competitive pressure, plant owners and operators across a wide range of industries are exploring new ways to reduce the cost of maintaining process equipment while upholding safety, reliability and productivity levels. The latest equipment and technology needs to be introduced to fulfil rising environmental, availability and efficiency requirements. This task demands competent, well-trained personnel who can meet or exceed your Quality, Health, Safety and Environmental (QHSE) expectations in a timely, cost-effective manner. Ageing plants, in particular, should adopt innovative mechanical servicing solutions delivered by a trusted partner to achieve optimum run times between shutdowns while minimising unscheduled maintenance.

## OUR MECHANICAL SERVICING SOLUTIONS

As the region's leading provider of specialised industrial services, CR3 offers unrivalled expertise in the mechanical servicing sector. With our in-house team of multidisciplinary

specialists across all related work streams, we excel in rising to the challenges set by our clients. The volume of repeat business we enjoy is a testament to our dedication, effort and competence.

## HOW WE SUPPORT YOUR BUSINESS

Our team is ready to support your mechanical servicing needs with fast responses and short lead-times that are the envy of the industry. We can safely deliver your projects on time and on budget by ensuring single-source control enabled by our multi-disciplinary approach and project management capability.

In addition to our comprehensive portfolio of mechanical servicing solutions, we complement our in-house expertise through strategic alliances with other market-leading organisations. CR3 currently partners with Hydratight (bolting solutions), Conbit (structural design and specialist offshore lifting / installation), Colt (online leak sealing / clamping enclosures) and Hilti (specialist cutting services), among others.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading one-stop provider of specialised maintenance services.

### Innovative equipment and processes

CR3 continually invests to secure the latest technologies and equipment. This enables us to support our clients with the most appropriate solutions to address the challenges of operating complex facilities. What's more, we maintain a continuous improvement cycle to satisfy ever-evolving requirements for delivering safer, faster and more efficient results. With each operational success, the experience and knowledge gained is channelled into the next generation of solutions.

### Outstanding QHSE performance

Training and experience go hand in hand wherever CR3 operates. With bespoke programmes aimed at keeping our technicians ahead of the field, we pride ourselves on delivering a best-in-class performance that continually exceeds our clients' expectations for safety and quality. This commitment to constant improvement is embedded in our management systems, which are certified to international standards including ISO 9001, ISO 14001 and ISO 18001. In addition, our internal project management and KPI systems allow us to deliver projects with an unwavering focus on safety, timeliness and cost.

### Unrivalled experience

CR3 is one of the only companies who can deliver simultaneous shutdowns in multiple countries. With decades

of front-line service delivery experience in projects of widely varying scope and complexity, we have evolved into a complete one-stop provider of mechanical servicing solutions. The experience gained from supporting clients across a broad range of industries allows us to respond to all issues as and when they appear. As specialists in their respective disciplines, our teams interface seamlessly to make even the most complex project seem relatively straightforward.

### Exceptional service

Our track record of successfully delivering on our commitments reflects both the 'can do' attitude of our management, as well as our rigorous planning, preparation and execution. When you work with CR3, you can be confident that you have selected the best partner for your project, regardless of size or value.

## OUR SOLUTIONS

- Static equipment maintenance – vessels & drums, columns & replacement of trays/ internals, heat exchangers incorporating full 'blind to blind' service
- Reactor repairs and maintenance
- In-situ flange facing and machining, bed milling, valve lapping services, etc
- Online leak sealing and pipe wrapping
- Hydraulic bolt tensioning and bolt torquing, joint integrity programmes
- Cold cutting and weld preparation
- Plant change and piping modifications
- Plant maintenance
- Support services such as pipe cold cutting, hydro & pneumatic testing
- Structural steel, piping fabrication and installation, stainless steel welding (inert and normal atmosphere)
- Diamond wire and diamond saw cutting, as well as Ultra-High Pressure Water Jet (UHPWJ) cutting

## YOUR BUSINESS BENEFITS

**Increase productivity** – by engaging us as your single point of accountability for all critical path elements. This means you are never more than a call away from key resources that can support your business and add value to your bottom line.

**Save time and cost** – through our deep understanding of the issues and our ability to provide high quality international solutions via local resources quickly and cost effectively.

**Access one-stop support** – with a solutions provider that can deliver the full spectrum of services required within the scope of work.

## CR3 IN ACTION

### The challenge

A refiner in Southeast Asia needed to revamp an RFCC unit by installing new internals to increase capacity, improve process efficiency and optimise yields.

### The solution

To facilitate the installation, CR3 employed several advanced cutting techniques to remove the top reactor head (165 tonnes) and cut a 35-tonne door in the regenerator section.

### The outcome

The refractory lining was cut cleanly without damaging the internals. In addition to completing the project safely, quickly and within budget, we saved the client substantial capital expenditure by ensuring the regenerator shell could be re-used.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy Efficiency**, **Engineering Excellence**, and Sustainable **Solutions**.

To learn more, visit [CR3.Group](#)



## Mercury Management Services



### YOUR CHALLENGES

Mercury is a naturally occurring by-product of hydrocarbon processing that potentially affects all stages of production. Its presence complicates shutdowns and turnarounds by contributing to the contamination, embrittlement and corrosion of process equipment. Mercury also presents significant Quality, Health, Safety and Environmental (QHSE) challenges during routine maintenance, repair and overhaul activities, and when handling process fluids and waste materials. To minimise these risks, a detailed understanding of rigorous safety precautions and proper handling procedures is essential.

### OUR MERCURY MANAGEMENT SOLUTIONS

CR3 has established an enviable reputation as the leading provider of mercury management solutions to the Hydrocarbon Processing industries. To further strengthen and complement our own in-house mercury management service offering, we have formed partnerships to provide mercury mapping studies including sampling and analytical services, comprehensive decontamination validation techniques and

cradle-to-grave solutions for mercury removal adsorbents. In addition, CR3 has existing relationships with a number of licensed disposal facilities to ensure the safe handling and disposal of waste materials.

### HOW WE SUPPORT YOUR BUSINESS

Your operations can benefit from our extensive knowledge and experience in the development and application of advanced techniques for the assessment, monitoring and removal of mercury. Our comprehensive range of mercury management solutions extends to all parts of the value chain within the Oil and Gas industry, from exploration and production through to processing, transmission and distribution.

CR3 and its partners represent one of the world's top mercury technology and decontamination providers. Our collective know-how draws on over 25 years of industry experience. Together, CR3 and its partners are able to offer specialised equipment, chemistries and methods for QHSE monitoring and mercury decontamination of hydrocarbon processing systems (vessels, columns, drums, pipelines, tanks and valves made from carbon, stainless steel or other materials susceptible to mercury contamination).

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading one-stop provider of specialised maintenance services.

### State-of-the-art processes and equipment

Utilising advanced methods and specialised equipment, we sample and analyse mercury in hydrocarbon process streams, including natural gas, natural gas liquids, refinery fuel gas and olefins. Our technology and equipment measures and analyses mercury in hydrocarbon process streams with detection limits well below 1 nanogram/Sm<sup>3</sup>.

### Outstanding QHSE performance

We work closely with clients to develop and implement various workplace QHSE monitoring plans. In addition, we provide mercury awareness training to our clients' operations and maintenance personnel (practical, field and emergency response).

Our clients also benefit from accredited and licensed mercury waste disposal, complete with Chain of Custody documentation. Working with certified and accredited disposal companies, our experts provide safe and transparent disposal options that meet all local regulations and environmental requirements. When it comes to removing hazardous mercury waste from offshore production platforms, we strive to ensure safety and timeliness to support efficient shutdowns and turnarounds.

### Unrivalled experience

CR3 has successfully completed thousands of mercury management projects. In addition, rigorous training

programmes keep our experts up to date with the latest technological developments, safety practices and industry regulations.

### Exceptional service

Our customer-focused culture ensures on-time, on-budget delivery for all your planned and unplanned maintenance activities. This commitment to service excellence is backed by our track record of integrated management systems that is certified to multiple international standards.

## OUR SOLUTIONS

- Mercury chemical cleaning and decontamination (process systems & equipment) including sludge removal
- Mercury mapping and sampling
- Pipeline chemical pigging, flushing and decontamination
- Mercury area and personnel occupational exposure monitoring
- Mercury scale, sludge, waste minimisation and management
- Hg sampling and analysis of process streams using advanced sampling and analytical techniques
- Hg natural gas / process stream / NGLs sampling, analysis and mapping
- Hg mass balance and mass flux studies for pipelines systems, process platforms, natural gas plants, NGL plants, LNG process trains and refineries
- Plant shutdown monitoring (steam-out, purging, vessel opening)
- Production platform mercury decontamination
- Cryo-separation equipment inspection, modelling
- Hg absorption bed catalyst removal / replacement
- Pipeline abandonment programmes (special programmes for mercury contamination)

## YOUR BUSINESS BENEFITS

**Save time and costs** – based on our ability to quickly assess the most appropriate solution for each application, as well as our proprietary technology that rapidly and effectively removes mercury contamination from processes and equipment.

**Minimise risk** – by working with a partner that can reduce mercury to extremely low levels in order to meet the most stringent international specifications to protect your plant, people and the environment.

**Increase efficiency** – through our deep understanding of the issues and our ability to provide high quality international solutions via local resources quickly and cost effectively, thereby enhancing the reliability and productivity of your operations.

## CR3 IN ACTION

### The challenge

A refiner in Southeast Asia registered mercury contamination in a 2km, 6-inch carbon steel pipeline connecting storage spheres to a downstream plant.

### The solution

CR3 completely removed the mercury by flushing the pipeline with an aqueous mixture of readily available chemicals. After cleaning, the mixture containing dissolved mercury was treated by calcium embedding for safe disposal.

### The outcome

Within 3 weeks, we maintained the downstream plant's integrity, safeguarding the operator against massive potential damages and lost production.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy Efficiency**, **Engineering Excellence**, and Sustainable **Solutions**.

**To learn more, visit CR3.Group**

# CR3

## Nitrogen Services



### YOUR CHALLENGES

Nitrogen is an extremely versatile commodity due to its availability and inert properties. It is used extensively in oil and gas facilities, both onshore and offshore and has applications ranging from purging, drying, and preservation of equipment to being used in the manufacture of petrochemicals, including ammonia.

Nitrogen is also extremely hazardous and short term exposure of no more than a few seconds, at a purity of 95% or higher, can have fatal consequences. Hence, having a proven track record of safely, reliably and efficiently handling, managing and working with nitrogen is a prerequisite that is in high demand.

### OUR NITROGEN SERVICES

CR3 offers the full range of nitrogen services, both onshore and offshore, and has completed some of the most challenging projects in Asia. All of our specialist technicians are highly trained, extremely skilled and have significant operations experience.

### HOW WE SUPPORT YOUR BUSINESS

As nitrogen is more easily and economically transported as a liquid, we have several nitrogen pump units for converting liquid nitrogen to gaseous nitrogen at a range of flow rates, pressures and temperatures, which can all be specified to suit the particular application via the control panel of the pump.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading onestop provider of specialised maintenance services.

### Innovative equipment and techniques

Whether you require purging to displace the atmosphere of a process, pressure testing and leak detection with mass spectrometry to verify equipment integrity, reactors cooled down quickly and efficiently, piggs propelled along a pipeline for cleaning and inspection or a nitrogen blanket to prevent air ingress and/or corrosion, we can satisfy your every need. The extra safety feature on our pumps in the form of over pressure protection (OPP), eliminates the chance of over pressurising a process system. The OPP is calibrated to the required safety pressure so that if it is tripped during pumping operations, the OPP shuts down the pump and prevents it from over-pressuring the system in question.

### Outstanding QHSE performance

CR3 nurtures highly skilled and motivated teams that are committed to achieving "Pacesetter Performance" for the execution of shutdowns and turnarounds. Our quality and safety track record is maintained by continually investing in structured training programmes, knowledge sharing, new processes and modern, automated equipment that increases productivity while minimising the risk of injury.

### Unrivalled experience

We aim to always deliver the best quality service, whilst ensuring the project is completed within schedule, within budget and without incident. We accomplish these achievements by investing in the latest equipment and technology to meet and exceed rising safety and quality standards in an efficient and cost-effective way.

## Exceptional service

Working as one team, we support you with detailed planning, coordination and execution, through our multi-disciplinary approach and project management capability. With the full range of nitrogen services available, we have the ability to recommend the most suitable solution for your specific needs.

### OUR SOLUTIONS

- Nitrogen purging
- Nitrogen drying
- Nitrogen pressure testing
- Nitrogen preservation / nitrogen blanketing
- Hot nitrogen stripping
- Reactor cool down
- Nitrogen-helium leak testing (NHLT)



## YOUR BUSINESS BENEFITS

**Benefit from a one-stop solution** – that eliminates the need to manage multiple contractors on site over the course of your project.

**Maintain high safety standards** – by choosing a partner with a proven commitment to ensuring a safer workplace, both onshore and offshore.

**Save time and money** – by maintaining single-source control of the entire project with a single point of contact for onshore and offshore operators.

## CR3 IN ACTION

### The challenge

An exploration and petroleum company wanted to increase production of a drilling well from 960 bbl per day to 1,900 bbl per day.

### The solution

CR3 mobilised a 180K, Zone II nitrogen pumping unit with accessories and connected it to the drilling well. Nitrogen was pumped into the hole at a rate necessary to increase the well pressure to achieve the desired flow rate.

### The outcome

The nitrogen gas lift successfully increased the production rate to the target of 1,900 bbl per day.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy** Efficiency, **Engineering** Excellence, and Sustainable **Solutions**.

**To learn more, visit CR3.Group**



## Offshore Projects & Maintenance



### YOUR CHALLENGES

The working environment offshore presents several challenges, including mobilising resources to and from the job site, the limitations on space and weight and the need for intrinsically safe equipment (typically Zone 2 rated), specially certified personnel and good housekeeping routines.

### OUR OFFSHORE SERVICES

To overcome these challenges, we provide the latest offshore equipment and technology, along with our multi-skilled specialists, to meet and exceed the rising demands of the offshore oil and gas market in an efficient and cost-effective way. Our combination of applying the latest equipment and multi-skilled technicians in a 'blind to blind' turnkey approach helps to minimise downtime and maximise returns.

### HOW WE SUPPORT YOUR BUSINESS

We offer all our normal maintenance activities offshore, such as Catalyst Handling, Industrial Cleaning, Pipeline & Process Services, Mechanical & Plant Maintenance Solutions and Turnarounds & Shutdowns. In addition, we also provide a full range of fabrication and installation services. Our fabrication and installation teams are spread across the region and provide general mechanical and maintenance services to all our customers.

We complement our in-house expertise through strategic alliances with other market-leading organisations, such as Conbit, to provide specialist offshore lifting and flare maintenance solutions and Batrec for supporting us with the safe disposal of mercury-contaminated wastes.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading one-stop provider of specialised maintenance services.

### Advanced equipment and technology

CR3 continually invests in the latest technologies and equipment so we can support our clients with the most suitable solutions to address offshore challenges. Our wide range of specialist, Zone 2 and rig-safe DNV certified equipment is purpose-built for these offshore applications. Designed with limited space and lifting capabilities in mind, we have all of the essential tools and equipment to complete our works safely and efficiently in hazardous offshore environments.



### Outstanding QHSE performance

We pride ourselves on delivering best-in-class performance that continually exceeds our clients' expectations for safety and quality. Highly trained technicians ensure even the most difficult-to-reach locations are accessed safely with our specialised rope-access technique, a safe method of working at height that applies practical ropework to support workers without the need for scaffolding.

## Unrivalled experience

With decades of experience, we are uniquely capable of offering a comprehensive solution for all your offshore needs to ensure on-time and on-budget delivery for all your projects. With our network of offices and workshop facilities across Asia, we have the ability to respond quickly to planned and unplanned events.

### Exceptional service

We optimise projects through meticulous planning, exceptional programme management, proactive procurement, easy-to-use systems and an experienced and multi-skilled workforce. We adopt a disciplined, multi-phase approach to plan, schedule, manage and execute projects of all sizes to ensure your equipment is back up and running quickly, safely, reliably and at optimal efficiency.

## OUR SOLUTIONS

- Fabrication and installation structural steel, modules, modification work
- Mercury monitoring, decontamination and sludge removal
- Catalyst and absorbent loading and unloading
- Chemical cleaning and decontamination
- Mechanical maintenance in a complete 'blind to blind' approach
- Electrical & instrumentation maintenance and project work
- Pipe fabrication, installation, testing and commissioning
- Turnarounds / shutdowns project work
- Waste handling / sludge removal and separation
- Pipeline pigging, flushing, cleaning and coating
- High pressure water jet cleaning of vessels, exchangers and piping
- Bolt tensioning and torquing
- In-situ machining and flange facing

## YOUR BUSINESS BENEFITS

**Benefit from a holistic approach** – ensuring single-source control through our multi-disciplinary approach and project management capability.

**Significant savings** – by providing the latest offshore equipment and technology, along with our multi-skilled specialists to minimise downtime and maximise returns.

**Uphold high safety standards** – by partnering with a contractor that continually invests in the latest tools and techniques to ensure optimal safety, quality and schedule efficiency.

## CR3 IN ACTION

### The challenge

An offshore producer in SE Asia needed to install new internals in each of their compressor train K/O drums which contained Hg along with other contaminants

### The solution

Proprietary chemicals were used to decontaminate the vessel. After confirming safe levels were achieved, old internals were removed and new internals installed, which involved cutting, drilling and bolting.

### The outcome

New internals prevented liquid carry-over, improved compressor efficiency and increased throughput.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy Efficiency**, **Engineering Excellence**, and Sustainable **Solutions**.

**To learn more, visit CR3.Group**



# Online Leak Sealing



## YOUR CHALLENGES

Process leaks, including fugitive emissions, are a major concern for all operating facilities, as they can result in wasteful and expensive releases, environmental issues and, in extreme cases, catastrophic incidents.

Knowing how to engineer a robust solution to stop a leak in a timely manner so that your plant, process unit or equipment item can continue operating until its next planned maintenance event, presents a significant opportunity that can deliver substantial savings.

## OUR ONLINE LEAK SEALING

We provide a full range of online leak sealing solutions, and can recommend the most suitable application for your specific needs. Our comprehensive approach covering emergency response, safety management, on-site

assessments, engineering, fabrication and installation puts a stop to all leaks, whilst allowing you to operate as normal, and delivers significant savings in the process.

## HOW WE SUPPORT YOUR BUSINESS

CR3 is available 24/7 to stop your leak, usually within 72 hours and without impacting production with our comprehensive online leak sealing service.

After our emergency response teams quickly assess the situation, we design, fabricate and install the appropriate solution online to arrest the leak while you continue to operate normally until a convenient time in the future when you can either properly repair or replace the leaking item.

Where practical to do so, we use Diamond wrapping to restore dented, gouged, corroded or eroded pipelines to their MAOP (Maximum Allowable Operating Pressure) and prevent them from shutting down.



## Pipeline Services



### YOUR CHALLENGES

Improperly manufactured, installed, or maintained pipelines, production facilities and pressure piping systems can pose a significant risk to your company, its people and the environment. The best way to ensure safe and reliable operational capabilities is to properly prepare and quality assure all essential equipment and piping during precommissioning and, again, during periodic maintenance and inspection routines.

### OUR PIPELINE SERVICES

We offer a comprehensive portfolio of properly engineered, high quality pipeline & process services both onshore and offshore, including pipeline cleaning, pressure testing, water flushing, hydro-jetting, cold cutting, specialist oil flushing, mercury decontamination, pneumatic testing, purging and nitrogen / helium leak testing, among others.

### HOW WE SUPPORT YOUR BUSINESS

We have considerable experience in pipeline & process services and can provide a full range of solutions to fit your pre-commissioning, commissioning and decommissioning requirements.

Operating under a single project management team to ensure optimal safety, quality and schedule efficiency, we support our customers with detailed planning, coordination and execution for various work scopes.

We have successfully performed numerous pipeline & process projects on newly built offshore modules, refineries, petrochemical plants and power stations, subsea pipelines, heat recovery steam generators (HRSGs), hydraulic & lube oil systems as well as decontaminating equipment from redundant offshore facilities during decommissioning.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading one-stop provider of specialised maintenance services.

### Advanced equipment and technology

We continually invest in modern automated equipment that delivers safer, faster and higher quality results. Rover, our multi-purpose remotely operated vehicle, works in all conditions, including underwater, at high temperatures and in explosive/toxic atmospheres. Rover minimises manned entry to these high-risk environments and performs a variety of tasks through the use of different attachments. Furthermore, our strategic partnerships boost our in-house capabilities, enabling us to provide end-to-end solutions that make use of the most advanced cleaning and maintenance technology available.

### Outstanding QHSE performance

Our drive towards safety excellence and Zero Harm is supported by modern equipment and processes that improve productivity and minimise risks. Additionally, we provide significant resources to ensure all staff have the best training available in the industry. We reward strong safety behaviour and provide substantial opportunities for staff to participate in safety workshops, toolbox talks and other events and campaigns that raise safety awareness.

### Exceptional service

Our professional personnel take pride in delivering our full range of pipeline services to the highest industry standards. We clean and inspect virtually all plant vessels, columns, drums and piping systems, both onshore and offshore, with services that can be tailored to requirements.

With our network of offices and workshop facilities across Asia, we have the ability to respond quickly to planned and unplanned events.



### Exceptional service

Choosing us as your single source to perform the full scope of catalyst handling services – isolating and opening the reactor, emptying and re-loading contents, closing the reactor and de-blinding or de-isolating it to save on standby time – ensures streamlined project delivery with simplified management and administration.

## OUR SOLUTIONS

- Pipeline cleaning
- Pipeline flooding
- Pressure testing
- Dewatering
- Nitrogen services including drying, purging & leak testing
- Online leak sealing
- Air blowing and drying
- Vacuum testing (inside to outside or outside to inside)
- Online pigging programs
- Application of internal coatings
- Mercury removal / decontamination / abandonment programs
- Intelligent pigging

## YOUR BUSINESS BENEFITS

**Benefit from a comprehensive solution** – by using a highperforming contractor to properly maintain your assets through a fully integrated and collaborative approach to ensure on-time and on-budget delivery for all your projects.

**Significant savings** – our end-to-end solutions and project management capability helps to minimise downtime and maximise returns.

**Uphold high safety standards** – with our combination of advanced equipment and highly trained multi-skilled technicians to ensure optimal safety.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy Efficiency**, **Engineering Excellence**, and Sustainable **Solutions**.

**To learn more, visit CR3.Group**

## CR3 IN ACTION

### The challenge

An exploration and production company in SE Asia needed to rehabilitate a 1.2 km subsea pipeline with the installation of a new liner.

### The solution

A 200-ton barge with crane facilitated the liner installation. The pipeline modifications required, engineering, cold cutting, welding, scaffolding and pigging.

### The outcome

Subsea pipeline was rehabilitated cost-effectively resulting in rapid recommissioning and improved flow properties whilst extending the life for at least 50 years.



# Plant Maintenance Services



## YOUR CHALLENGES

Improving asset reliability and equipment uptime through total plant maintenance is a source of competitive advantage for many operators. In recent times, there has been much more emphasis on proactive maintenance techniques that aim to monitor and predict when intervention is necessary rather than correcting failures when they occur to maximise productivity and reduce long-term maintenance costs.

## OUR PLANT MAINTENANCE SERVICES

We are vastly experienced at providing total plant maintenance services across the asset-intensive industries, with in-depth knowledge and solutions to deal with the planned and unplanned issues that can occur. We have the processes, systems, advanced equipment and trained specialists to cope with all types of planned maintenance (PM), corrective work, pit stops, shutdowns, minor upgrades,

revamps and emergencies to ensure each task is planned and executed with a maximum focus on safety, whilst eliminating interface issues and minimising cost.

## HOW WE SUPPORT YOUR BUSINESS

We deliver your planned maintenance routines on time and on budget through our multi-disciplinary approach and project management capability, leading to significantly fewer maintenance staff on site and minimal repeat work.

Unplanned or emergent work is quickly scheduled, resourced, and actioned, ensuring back-logs are maintained at manageable levels.

Our multi-skilled workers along with advanced systems and superior technology, deliver significant returns and continuous improvements in process safety, reliability, and equipment effectiveness.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading one-stop provider of specialised maintenance services.

### Innovative equipment and techniques

Our regular investments in the latest equipment, tools and systems, operating under a single project management team to ensure optimal safety, quality and schedule efficiency, to support customers in their everyday operations across the full range of services.

### Outstanding QHSE performance

Our investment in training, equipment and SMART systems combined with our focus on rigorous planning, preparation and execution of work ensures we can deliver a best-in-class performance that continually exceeds our clients' expectations for safety and quality.



### Unrivalled experience

Our planning and workflow management systems bring improved transparency and allow us to track compliance with operational and contractual objectives, which are crucial in meeting schedules and achieving desired quality and customer satisfaction targets. We can track available resources across multiple plants, the status of jobs, including

those completed and billed, employee overtime, absenteeism, and employee turnover as well as manage our payroll. These systems have delivered significant productivity gains and are being used on multiple sites to track hundreds of jobs every day.

### Exceptional service

We pride ourselves on being able to mobilise personnel at short notice and to deploy a multi-skilled and effective workforce ready to address any maintenance task, whether planned or not. Together, with our strategic partnerships boosting our in-house capabilities in key areas, we ensure the highest levels of competence and professionalism are present on every job.

## OUR SOLUTIONS

- Scaffolding and other access solutions
- Static and rotating equipment maintenance
- Mechanical services for all plant and equipment including removal, reinstallation, and operational alignment
- Routine and specialist rigging requirements
- Fabrication and installation of all pipework and steelwork including special alloys
- Machining workshop services
- Heat exchanger repairs and retubing
- Storage tank cleaning and maintenance
- Stores and stock management
- Non-destructive testing (NDT) & post-weld heat treatment (PWHT)
- Procurement services
- Insulation / refractory / painting
- Valve maintenance
- Online leak sealing
- Industrial cleaning
- Pipeline and process services
- Basic and detailed engineering services via specialist partners
- Shutdowns and turnarounds
- Pre-commissioning and commissioning services
- Operations & Maintenance manpower support
- Daily housekeeping and fabric maintenance services (FM)
- Drivers and road machinery operators

## YOUR BUSINESS BENEFITS

**Increase productivity** – by having a single point of contact we can deploy a multi-skilled and effective workforce ready to address any maintenance task, whether planned or not.

**Save time and money** – by eliminating interface issues with our multi-disciplinary approach and project management capability, leading to significantly fewer maintenance staff on site.

**Ensure high safety standards** – by working with a partner that is committed to delivering the highest safety standards in the industry. We offer the latest equipment, tools and systems, operating under a single project management team to ensure optimal safety.

## CR3 IN ACTION

### The challenge

A refiner wanted to change their approach to plant maintenance and select a single umbrella contractor to improve safety, quality and productivity.

### The solution

We developed a multi-skilled workforce from scratch, implemented a workflow management system to track performance and improved safety and quality through incentive programs.

### The outcome

Productivity rose sharply with significantly less manpower on the back of deploying a multi-skilled workforce with access to advanced automated equipment.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy Efficiency**, **Engineering Excellence**, and Sustainable **Solutions**.

To learn more, visit [CR3.Group](https://www.cr3group.com)

# CR3

## Pre-Commissioning Services



### YOUR CHALLENGES

Prior to taking any reactor, vessel or piping system into commission, owners and operators of refineries and other processing plants need assurance of safety, quality and reliability. An improperly manufactured or installed pipeline can pose a significant risk to your company, its people and the environment. The best way to establish and maintain prime operational capabilities is to properly prepare and quality assure all essential equipment at the precommissioning stage.

### OUR PRE-COMMISSIONING SERVICES

CR3 offers a comprehensive portfolio of properly engineered, high quality pre-commissioning and commissioning services. Operating under a single project management team to ensure optimal safety, quality and schedule efficiency, we support our clients with detailed planning, coordination and execution

for various scopes of construction completion, pre-commissioning and commissioning activities such as pressure testing, water flushing, air blowing and drying. In addition, our highly experienced, multidisciplinary experts undertake many specialist activities such as chemical cleaning, lube oil flushing, hydro jetting, pneumatic testing, helium / nitrogen leak testing, inspections and other associated actions within the construction environment.

### HOW WE SUPPORT YOUR BUSINESS

Engaging us as your single-source , all-inclusive solutions provider gives you confidence that our highly trained experts are applying their decades of experience to optimise your facility's performance. Our professional personnel take pride in delivering our full range of services to the highest industry standards.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading one-stop provider of specialised maintenance services.

### Innovative equipment and processes

CR3 does not compromise when it comes to investing in state-of-the-art tools and machinery. As part of our commitment to offering superior service to our clients, we use modern automated equipment that guarantees unrivalled quality, speed and safety in every project. Furthermore, our strategic partnerships augment our inhouse offering, enabling us to provide holistic solutions that utilise the most advanced cleaning and maintenance technologies available.

### Exceptional QHSE performance

Safety is the central tenet of every pre-commissioning project we undertake. Our commitment to safety has led to the implementation of our own safety passport system, with all our technicians being accredited through a rigorous in-house training programme. You and your stakeholders can be assured that our work is not only timely and costefficient, but safe and reliable too.

### World-class experience

With decades of front-line multidisciplinary experience, CR3 is uniquely capable of offering a one-stop solution for all your pre-commissioning needs. Our specialists are certified experts, with internationally recognised certifications that cover the detailed operation and maintenance of the units under their care.

## Unrivalled service

Over the years, we've nurtured a strong customer-focused culture that ensures on-time, on-budget delivery for all your planned and unplanned pre-commissioning, commissioning, maintenance and de-commissioning activities. Our commitment to service excellence is backed by our track record of integrated management systems that are certified to multiple international standards.

## OUR SOLUTIONS

### Pre-commissioning of reactors and vessels

- Nitrogen purging of hydrocarbons
- Initial catalyst loading
- Flange management
- Column internals installation
- Cold cutting
- Bolt torquing and tensioning
- Pneumatic testing
- Air blowing and drying

### Pre-commissioning pipeline cleaning

- Nitrogen / Helium Leak Testing (NHLT)
- Vacuum testing (inside to outside or outside to inside)

- Pressure testing
- Nitrogen preservation
- Hot oil flushing of critical oil piping systems
- Online pipeline maintenance pigging programmes
- Internal pipeline coating
- Pipeline mercury removal / decontamination programmes
- Pipeline descaling and derusting
- Pipeline gauging
- Pipeline intelligent pigging
- Pipeline abandonment programmes (special programmes for mercury contamination)
- Special oxygen piping systems

## YOUR BUSINESS BENEFITS

**Benefit from a one-stop solution** – that eliminates the need to manage multiple contractors on-site over the course of your project.

**Ensure high safety standards** – by choosing a partner with a proven commitment to maintaining a safer workplace in both onshore and offshore environments.

**Save time and money** – with a single contractor that supports numerous activities and reduces costs by utilising multi-skilled personnel to perform the full range of jobs you need done.

## CR3 IN ACTION

### The challenge

An offshore fabrication company needed a specialist contractor to perform the pre-commissioning of a new subsea pipeline system.

### The solution

CR3 was chosen to perform the pre-commissioning due to our dedicated commitment to safety. Upon appointment, CR3 proceeded to perform full precommissioning operations, coordinating and supervising the project throughout.

### The outcome

The pre-commissioning process was completed safely and efficiently, with all relevant risks being identified and dealt with and all tasks completed according to schedule.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy Efficiency, Engineering Excellence, and Sustainable Solutions.**

**To learn more, visit CR3.Group**



# Revamp, Construction & EPCC Services



## YOUR CHALLENGES

Whether you are planning to increase capacity, add a new process or simply modernise your plant, it is often necessary to team up with a reliable local partner who can support with all phases of the project from engineering through to commissioning and ongoing maintenance.

## OUR REVAMPS, CONSTRUCTION & EPCC

Operating under a single project management team to ensure optimal safety, quality and schedule efficiency, we support our customers with detailed planning, execution and ongoing maintenance services for various revamp, construction and EPCC scopes.

We deliver your projects safely, on time and on budget with our multi-disciplinary approach and project management capability. Our planning and workflow management systems bring improved transparency and allow us to track compliance with operational and contractual objectives, which are crucial in meeting schedules and achieving quality plus customer satisfaction metrics.

## HOW WE SUPPORT YOUR BUSINESS

We are experienced at providing comprehensive revamp and construction projects and, together with our technical partners, can support clients with all aspects covering engineering, fabrication, construction, commissioning and project management. Often these projects coincide with planned shutdowns and turnarounds, which we can undertake in addition to the revamp, improving safety, eliminating interface issues and minimising cost.

We perform small-to-medium size EPCC (Engineering, Procurement, Construction and Commissioning) projects and can provide a full turnkey package including operations and maintenance of the new process module or unit.

We have dedicated workshops for fabricating structural and carbon steels separate from stainless steel and special alloys, like Hastelloy, to avoid cross-contamination. We can demolish and remove redundant piping and processes as well as embed large equipment items into existing facilities.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading one-stop provider of specialised maintenance services.

### Innovative equipment and techniques

CR3 has unparalleled access to the latest equipment and technology from around the world ensuring our customers always benefit from the latest solutions and ways of working on any given project. We've launched an Innovation Program to allow all stakeholders to participate in our continuous improvement so we can identify better solutions to deliver increased value for all.

### Outstanding QHSE performance

Our investment in training, equipment and SMART systems combined with our focus on rigorous planning, preparation and execution of work ensures we can deliver a best-in-class performance that continually exceeds our clients' expectations for safety and quality.



### Unrivalled experience

Our large in-house teams of highly trained engineers, planners, procurement personnel and technicians combined with our regular investments in the latest equipment, tools

and systems maintain our reputation as the region's leading provider of revamps, construction and EPCC projects.

### Exceptional service

Through constructability reviews, we can maximise the early installation of structures and new equipment pre-turnaround, whilst the facility is online, reducing schedules significantly and peak numbers during the subsequent outage.

Our strategic partnerships boost our in-house capabilities in key areas to ensure the highest levels of competence and professionalism are present on every job. With each project success, the experience and knowledge gained is channelled into the next generation of solutions.

## OUR SOLUTIONS

- Basic and detailed engineering services via specialist partners
- Dismantling, demolishing and removal of redundant equipment
- Fabrication of structural and carbon steels including piping systems
- Fabrication and installation of all pipework and steelwork including special alloys
- Fabrication of stainless steel and special alloys including Hastelloy
- Construction / constructability reviews
- Installation of large equipment and piping systems
- Procurement services
- Scaffolding
- Hot / cold cutting
- Rigging
- Alignment
- In-situ welding / overlay
- Non-destructive testing (NDT)
- Insulation / Refractory
- Fired heater revamps
- Flare system revamps
- Shutdowns and turnarounds
- Pre-commissioning and commissioning services
- Operations and Maintenance

## YOUR BUSINESS BENEFITS

**Increase productivity** – with our workflow management systems that have improved transparency of available resources and allows us to track compliance with operational and contractual KPIs and assist in delivering significant productivity gains for our customers.

**Save time and money** – with our multi-disciplinary approach and project management capability that eliminates interface issues and minimises cost to deliver your projects safely, on time and on budget.

**Ensure high safety standards** – by working with a partner that offers regular training and safety awareness programs to maintain a strong safety focus and excellent safety culture.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy Efficiency**, **Engineering Excellence**, and Sustainable **Solutions**.

To learn more, visit [CR3.Group](https://www.cr3group.com)

## CR3 IN ACTION

### The challenge

A refinery underwent their largest and most complex revamp and turnaround in history to increase capacity by 10,000 b/d.

### The solution

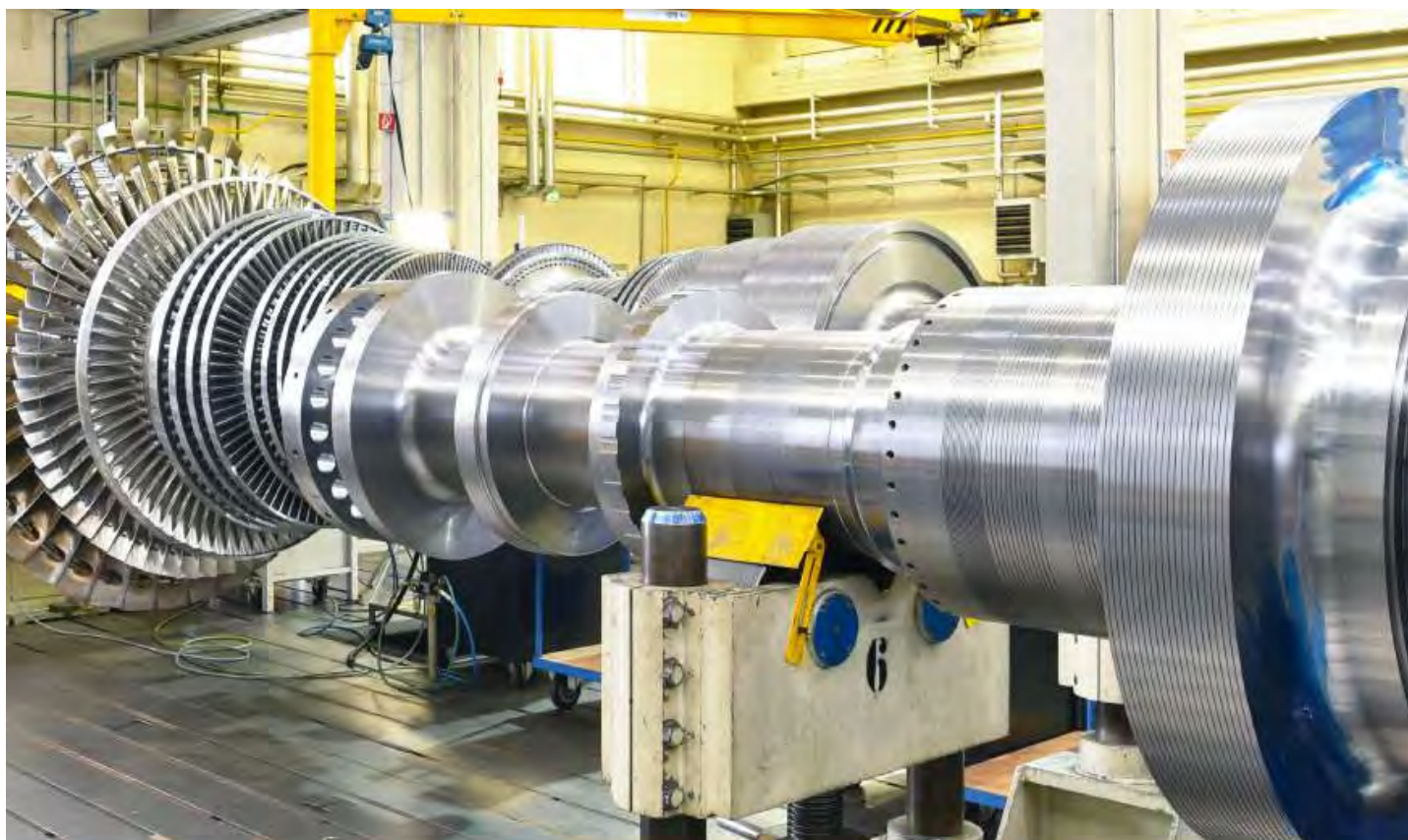
Constructability reviews maximised the installation of new pipework, structures and equipment pre-event, saving significant time and reducing manpower numbers during peak periods.

### The outcome

Refinery was restarted on schedule and performed as expected at new capacity. An innovative contract model with aligned objectives delivered significant savings.



# Rotating Equipment Maintenance



## YOUR CHALLENGES

Ensuring equipment reliability is key to achieving production targets, particularly when rotating machines are being operated at or near their limit. This becomes even more critical when unplanned shutdowns or outages, due to equipment failures, results in lost opportunities, which are extremely painful and costly to deal with.

## OUR ROTATING EQUIPMENT MAINTENANCE

CR3 provides comprehensive maintenance solutions for all your rotating equipment requirements on any type and size of facility across Asia. We regularly provide predictive, preventive and, when necessary, corrective maintenance for rotary equipment and our teams take full responsibility for the safe and reliable operation of your rotating assets. Either working directly for an end-user or as a specialist contractor under an Original Equipment Manufacturer (OEM), we keep your plant running for longer and avoid any unwanted downtime by managing the maintenance of your rotating equipment with the minimum of fuss.

## HOW WE SUPPORT YOUR BUSINESS

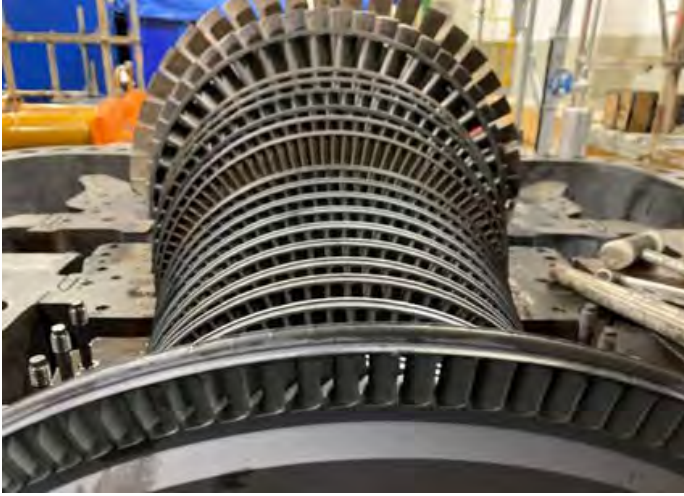
Combining our rotary expertise with our other specialist services means we can provide an integrated, multidisciplinary solution across the entire facility.

Our experienced and highly trained experts adopt good routines and practices to care for and maintain your turbomachinery at peak operating conditions. We tailor our services to match the exact requirements of your situation and can support facilities in any location, irrespective of the conditions.

Our consultants are regularly called upon to evaluate and audit the maintenance strategies adopted by our clients. These studies highlight the gaps between what is being followed versus what is desired and provide practical guidance on what can be done to close these gaps as well as advice on how to improve the overall health of the plant by adopting best-of-breed maintenance practices.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading one-stop provider of specialised maintenance services.



## Advanced equipment and technology

We continue to invest in the best equipment, systems and performance management tools to support our project delivery teams and remain at the leading edge of the industry. Our experienced and highly skilled field teams use high quality, specialised equipment for maintaining rotary equipment including laser alignment kits.

## Unrivalled experience

We provide rotating equipment maintenance to many clients including the world's largest refinery. Our teams take full responsibility for the safe and reliable operation of your rotating assets as if they were their own.

Our commitment to continuous improvement is demonstrated by the many projects we complete in record time and our ability to continually maintain or reduce the cost of services, whilst maintaining the highest levels of safety and service excellence.

## YOUR BUSINESS BENEFITS

**Benefit from a holistic approach** – with our multi-skilled, competent and motivated team, supported by high quality systems, procedures and equipment.

**Optimise efficiency and profitability** – by ensuring our customers have access to the latest technology and processes to deliver safer, faster and more productive solutions.

**Ensure high safety standards** – by working with a partner that provides significant resources to ensure all staff have the best training available in the industry.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy Efficiency**, **Engineering Excellence**, and Sustainable **Solutions**.

**To learn more, visit CR3.Group**

## Outstanding QHSE performance

We invest in the latest equipment to enhance safety and quality standards. We continuously improve the skills of our people at our world-class training facilities using certified trainers to ensure we can respond safely, quickly, and effectively to any potential problem.

## Exceptional service

When equipment breaks down, we can help you understand why the failure happened to prevent the same thing from occurring again. By using detailed failure analysis techniques, such as Failure Modes Effective Analysis (FMEA), we can identify root causes and recommend what steps are needed to enhance the reliability of your rotary equipment.

You can count on us to provide a multi-skilled, competent and motivated team, supported by high quality systems, procedures and equipment to meet your ever-evolving requirements.

## OUR SOLUTIONS

- Rotating equipment predictive, preventive, and corrective maintenance
- Rotating equipment maintenance audits
- Support OEM's with rotating equipment maintenance
- Specialist advice on maintaining and overhauling rotating machines including critical equipment
- Conduct root cause failure analysis (FMEA)
- Provide troubleshooting support
- Provide commissioning support
- Witness critical tests for rotating equipment
- Reliability studies and optimising equipment availability

## CR3 IN ACTION

### The challenge

A polypropylene plant in Asia needed to overhaul a twin-screw extruder within a tight schedule.

### The solution

Over 60 elements from the extruder section, including pieces from the two 7-metre long screws, had to be dismantled, inspected, and tested (some with melt temperature analysis) before being reassembled.

### The outcome

The job was completed within the scheduled duration and by using fewer technicians than normal due to our multiskilled approach. The unit achieved its expected levels of productivity and efficiency after the re-start.



## Scaffolding Services



### YOUR CHALLENGES

Recognising the need for the highest safety standards, particularly when working at height, shorter schedules, and greater cost efficiency, we have established a fully integrated scaffolding business to provide a one-stop solution to serve all your maintenance needs.

Whether you are replacing column internals, installing new equipment, carrying out modifications or performing a sitewide turnaround in an onshore or offshore setting, we can provide the appropriate level of scaffolding access to match your requirements, in addition to performing the maintenance activity itself. This integrated approach improves safety, reduces time, and delivers significant cost savings.

### OUR SCAFFOLDING SERVICES

From pre-planning, through execution and dismantling, our diverse range of talent ensures a comprehensive access solution that is scalable for any project. CR3 devotes a

great deal of time to the pre-planning phase to ensure our scaffolding materials meet the safety and quality requirements and considers all of the trades that will be impacted by the construction. We can be counted on to provide safe, reliable and quality scaffolding services to BS/EN standards efficiently and on schedule.

### HOW WE SUPPORT YOUR BUSINESS

Our dedicated, highly trained and multi-skilled technicians can help you reduce numbers on site and ensure no time is wasted in handing over from the scaffolding contractor to the maintenance contractor, as we are all the same team. With our experience working with different types of scaffolding, including tubular and modular as well as with software systems that allow you to retrieve previous scaffolding designs quickly and effectively, we are ready to support you on any job, large or small. As the leading one-stop provider of specialised maintenance and industrial services, we are able to support your projects from start to finish by having expert staff on site throughout the entire process.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading one-stop provider of specialised maintenance services.



## World-class equipment and techniques

We continually invest in modern training techniques and scaffolding equipment to ensure we are well prepared and take the necessary precautions to mitigate the considerable hazards of working at height.

## Outstanding QHSE performance

We maintain high safety standards through our proven commitment to ensuring a safer workplace, both onshore and offshore, for all projects.

CR3's unique culture, driven by the safety and wellbeing of our people, differentiates us from everyone else. We continually invest in state-of-the-art training and equipment to ensure our people always put safety first.

Our safety performance is further enhanced through our Zero Harm, Behavioural Change and Stop Work campaigns that continue to deliver significant improvements in workplace safety.

## Exceptional service

As the leading comprehensive provider of specialised maintenance and industrial services, we are able to support your projects from start to finish by having expert staff on site throughout the entire process. We offer a full range of maintenance and industrial services that are fully integrated for any refurbishment, shutdown or maintenance project. Our multiskilled workforce and a one-team approach help minimise schedule and costs to support your scaffolding requirements throughout all phases of your project lifecycle.

## Unrivalled experience

We deliver your projects safely, on time and on budget by ensuring single-source control through our multi-disciplinary approach and project management capability. Our workflow management systems bring improved transparency of available resources and allows us to track compliance with operational and contractual KPIs and assist in delivering significant productivity gains for our customers.

## OUR SOLUTIONS

- On-site evaluation of project requirements
- Clear specification of scope and usage requirements
- Engineering designs including determination of load requirements
- Installation of system scaffolding to BS/EN standards
- Inspection and tagging of scaffolding
- Removal of scaffolding upon project completion

## YOUR BUSINESS BENEFITS

**Benefit from a holistic approach** – by offering a full range of services that can be seamlessly integrated as multi-discipline packages for any refurbishment, project, shutdown or maintenance contract.

**Save time and money** – with experienced experts that can support your operations throughout all phases of your project lifecycle.

**Maintain high safety standards** – by choosing a partner with a proven commitment to ensuring a safer workplace, both onshore and offshore, for all your project requirements.

## CR3 IN ACTION

### The challenge

A power plant in SE Asia required an access solution to carry out inspections inside a large boiler.

### The solution

Despite a significant change in scope during the project preparation phase, we provided additional labour and equipment needed for the much bigger job on short notice.

### The outcome

We safely erected and dismantled the 36-metre-high structure covering 8,300 cubic meters and provided full access for all required inspections within the original critical timeframe.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy Efficiency, Engineering Excellence, and Sustainable Solutions.**

**To learn more, visit [CR3.Group](#)**



# Shutdown & Turnaround Services



## YOUR CHALLENGES

Every industrial processing plant must undergo periodic shutdowns and turnarounds to maintain safe operations and optimal production levels while meeting ever-evolving Quality, Health, Safety and Environmental (QHSE) standards. Failing to execute shutdowns and turnarounds safely and efficiently can have a profound impact on your business, its people and the environment. Given the potentially huge losses for every day of downtime, delivering safe shutdowns and turnarounds while minimising both the number and duration of these events is critical.

## OUR SHUTDOWN AND TURNAROUND SERVICES

Shutdowns and turnarounds are the mainstay of CR3's business. We adopt a disciplined, multi-phase approach to plan, schedule, staff and execute projects of all sizes to ensure your plant is back up and running quickly, safely, reliably and at optimal efficiency. Our One-Stop Multidiscipline Solution enables us to deliver safe, successful shutdowns and turnarounds throughout the Refining, Petrochemical, Upstream Oil & Gas, Power Generation and other heavy industries.

## HOW WE SUPPORT YOUR BUSINESS

You can engage our experts from the very onset to lead or support detailed project planning, preparation, scope challenges and compilation of work packages. During shutdowns, we mechanically isolate parts that require routine maintenance, allowing the rest of the plant to remain operational while maintenance is carried out. The affected equipment is opened up, cleaned, inspected and repaired before being reinstated, deisolated, and readied to be taken back into the process. For turnarounds, we perform the same scope of maintenance and repair work on a larger scale involving a plant-wide shutdown.

Our holistic approach encompasses every aspect of shutdowns and turnarounds, from beginning to end. To identify opportunities for further improvements, cost savings and best practices, we place particular emphasis on the debriefing stage. Together with our strategic partners, we have access to the necessary resources, equipment, expertise and experience to carry out multiple large-scale projects simultaneously.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading one-stop provider of specialised maintenance services.

### State-of-the-art equipment and processes

We optimise shutdown times through meticulous planning, exceptional programme management, proactive procurement, easy-to-use systems and processes for tracking progress against KPI's, and the deployment of experienced manpower to operate modern automated equipment that is quicker, safer and more efficient. This offering is enhanced by a strong network of technology partners with advanced maintenance solutions to improve quality while setting new safety standards and boosting asset performance.

### Outstanding QHSE performance

CR3 nurtures highly skilled and motivated teams that are committed to achieving "Pacesetter Performance" for the execution of shutdowns and turnarounds. Our quality and safety track record is maintained by continually investing in structured training programmes, knowledge sharing, new processes and modern, automated equipment that increases productivity while minimising the risk of injury.

### Depth of experience

CR3 is recognised as the region's leading shutdown and turnaround expert for onshore and offshore projects. Every service we provide is delivered as part of our shutdown and turnaround activities. This means our personnel are

constantly exposed to these types of events. Each year, we perform around 100 shutdowns and turnarounds across the region.

### Exceptional service

Choosing us as your single source to perform the full scope of catalyst handling services – isolating and opening the reactor, emptying and re-loading contents, closing the reactor and de-blinding or de-isolating it to save on standby time – ensures streamlined project delivery with simplified management and administration.

## OUR SOLUTIONS

- Specialised mechanical services
- Column and tower internal modifications and repairs
- Heat exchanger services including repairs and retubing
- Catalyst handling and reactor services
- Chemical cleaning and decontamination
- Mercury management and decontamination
- High pressure water jet and industrial cleaning
- Tank cleaning and repairs
- CDT furnace decoking
- Decommissioning and pipeline services
- Nitrogen services
- Offshore maintenance services
- Flare tip replacements and repairs
- Controlled bolting and flange management
- In-situ machining
- Online leak sealing
- Waste handling and vacuum truck services

## YOUR BUSINESS BENEFITS

**Benefit from a one-stop solution** – for planning, scheduling, managing and executing all maintenance activities required during even the largest shutdowns, saving you the expense and hassle of engaging multiple contractors for a single event.

**Save time and money** – by maintaining single-source control of the entire project with a single point of contact for onshore and offshore operators.

**Maintain high safety standards** – by choosing a partner with a proven commitment to superior safety in the workplace.

## CR3 IN ACTION

### The challenge

An integrated refinery and petrochemical complex in Asia had to open, clean, inspect and box up over 150 major equipment items in a 30-day window.

### The solution

CR3 deployed 30 people a year ahead of the turnaround to plan schedules and maximise efficiency. Over 1,200 personnel were mobilised to execute the works.

### The outcome

With zero lost-time incidents and zero medical-time incidents, the shutdown was completed within budget and actually beat the schedule by a few days, achieving significant savings for an extremely satisfied client that now looks forward to a 5-year run before the next major turnaround.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy Efficiency**, **Engineering Excellence**, and Sustainable **Solutions**.

To learn more, visit [CR3.Group](#)



# Storage Tank Cleaning & Maintenance



## YOUR CHALLENGES

Traditional methods of tank cleaning and maintenance are time-consuming, hazardous, and costly. To combat these issues, operators are increasingly searching for contractors who can shorten cleaning and maintenance cycles, apply non-man entry cleaning and inspection techniques, and recover valuable product from the removed waste.

## OUR TANK CLEANING & MAINTENANCE

CR3 provides comprehensive solutions for all your tank cleaning and maintenance requirements, whether it is for a small product tank or a large crude oil storage tank. Our teams take full responsibility from pre-job preparation and planning, through to set-up, cleaning, waste handling and reclamation, with options to match each individual scenario.

## HOW WE SUPPORT YOUR BUSINESS

We provide full project management, working to the highest standards within the refining and petrochemical industries. Integrating the tank cleaning with our inspection and repair capability gives clients a full turnkey option with all the interfaces removed so that the focus is directed on doing the job safely, on time and within budget.

Our team of experienced engineers can also plan, manage, and execute any repairs necessary to ensure compliance with API or similar standards. Whether you require full circumferential repairs, strake sections, pontoons, bottom or top plating, wind girders or seals replacing, we can cope with all these issues and more. Furthermore, we will provide you with the confidence that all scopes will be completed safely and efficiently.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading onestop provider of specialised maintenance services.

## Innovative equipment and techniques

CR3 continually invests in the latest technologies and equipment. Our non-man entry cleaning solutions include:

- Multi-directional tank cleaning heads combined with chemical treatment
- Manway cannons and tank sweepers, capable of targeting sludge deposits up to 60 metres away
- Robotic cleaning with vacuum or pumping removal of the waste stream
- Suspension separation using proprietary hydrocarbon chemical addition
- Recovery and reclamation of valuable hydrocarbons

## Outstanding QHSE performance

By investing in the latest innovations and technology, we continue to raise health and safety standards, reduce schedules, and develop new solutions to meet the ever-increasing aspirations of our clients. Our quality and safety track record is maintained through structured training programmes, knowledge sharing, new processes and modern, automated equipment that increases productivity while minimising the risk of injury.

## Depth of experience

CR3 offers holistic packages that carry the best practices and experiences gained in one discipline over to the next. We aim to always deliver the best quality service, whilst ensuring the project is completed within schedule, within budget and without incident.

## YOUR BUSINESS BENEFITS

**Benefit from a one-stop solution** – integrating the tank cleaning with our inspection and repair capabilities gives clients a full turnkey option with all the interfaces removed so that the focus is directed on doing the job safely, on time and within budget.

**Minimise safety risks** – with advanced equipment and innovative solutions that reduces the manpower required and minimises confined space entry for cleaning and inspection.

**Save time and money** – with a single contractor that supports numerous activities and reduces costs by utilising multi-skilled personnel to perform the full range of jobs you need done.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy Efficiency, Engineering Excellence, and Sustainable Solutions.**

**To learn more, visit [CR3.Group](#)**

As specialists in their respective disciplines, our teams interface seamlessly to make even the most complex project seem relatively straightforward.

## Exceptional service

As the region's leading multidisciplinary service provider, CR3 knows the complete production process better than anyone. We also understand the challenges our customers face.

## OUR SOLUTIONS

- Resuspension of sludge to improve storage capacity
- Non-man entry cleaning of intermediate & final product tanks (various methods including robotic cleaning)
- Non-man entry cleaning of crude oil tanks (various methods including robotic cleaning)
- Separation of hydrocarbons, water, and sludge by chemical addition
- Recovery and reclamation of valuable hydrocarbons
- Tank repairs including scaffolding, cold cutting, and welding
- Tank revamps and rejuvenations
- Storage tank installation



## CR3 IN ACTION

### The challenge

A crude oil storage tank required cleaning, inspecting and major repairs to the floor (cone up to cone down). Waxy sludge and sand had to be removed prior to the repairs.

### The solution

Our powerful hydraulic sludge pumps remove almost all of the heavy sludge. We designed a new tank floor to a cone down type and replaced new bitumen foundation.

### The outcome

Advanced hydraulic pumping technology ensured the tank was cleaned significantly faster than conventional methods and the tank was returned to service earlier than expected.



# Total Heat Exchanger Maintenance Services



## YOUR CHALLENGES

Heat exchangers of all types and sizes form an integral part of any industrial operating facility and require periodic servicing to restore heat transfer performance and normal production levels.

## OUR HEAT EXCHANGER MAINTENANCE

We have substantial experience in planning, managing and executing every aspect of heat exchanger maintenance, from the pulling of bundles and expert cleaning to providing all manner of repairs, reinstating the exchangers back in service and leak testing them to ensure asset integrity. This comprehensive approach enables our customers to handover the total work scope to one contractor without any interface issues.

## HOW WE SUPPORT YOUR BUSINESS

We perform projects of all sizes, from small single heat exchanger jobs to substantial contracts where several hundred heat exchangers are removed, cleaned, inspected to IRIS standards and reinstated in a single event such as sitewide shutdowns. All related requirements, such as scaffolding and lifting, are handled too.

As with many types of process equipment, we are very knowledgeable of the issues involved with maintaining and servicing all types of heat exchanger and provide advanced equipment along with experienced and professional personnel to execute all aspects of these services.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading one-stop provider of specialised maintenance services.

### Advanced equipment and technology

We are one of the only contractors in Asia to have bundle pullers capable of extracting bundles up to 125 tons in size. Our advanced automated technology for Internal Bundle Cleaning (IBC) and Outer Bundle Cleaning (OBC) significantly improves safety, quality and makes the cleaning process much more efficient. The internal bundle cleaners comprise multiple rigid lances capable of cleaning several tubes simultaneously to minimise downtime. Additionally, the multi-lance system has significantly increased productivity and quality, as much higher pressures and flows are able to be applied.

### Outstanding QHSE performance

We continually invest in the latest equipment and processes to improve safety and quality standards. Our advanced cleaning equipment eliminates the potential hazards with conventional methods, of having personnel working in close proximity to the high pressure water, by completely removing the technician from the line of fire and enabling the cleaning process to be fully controlled from the safety of an operator cabin.

### Unrivalled experience

We deliver your projects safely, on time and on budget by ensuring single-source control through our multi-disciplinary approach and project management capability. With our network of offices across Asia, we have the ability to respond quickly to planned and unplanned events.

We have strong onshore and offshore capabilities, a proven track record of successful project delivery and continually

invest in new technology to improve safety and generate more value for customers.

## Exceptional service

We pride ourselves on delivering safer, faster and more efficient results. With each operational success, the experience and knowledge gained is channelled into the next generation of solutions.

## OUR SOLUTIONS

- Spading and isolation (including Breathing Apparatus as required)
- De-sludging prior to decommissioning
- System scaffolding
- Dis-assembly and reassembly including bolt torquing and tensioning
- Lifting of components
- Cleaning of heat exchangers using automated equipment:
  - High pressure water jetting
  - Ultra-high pressure water jetting
  - Dry cleaning by rotating brushes
- Pressure testing:
  - Hydrotesting
  - Helium leak detection
  - Non-Destructive Testing
  - Centest
  - IRIS testing
  - X-ray
  - Borescope
  - Online thermodynamics monitoring
- Ultrasonic cleaning
- Robotic cleaning of bundles in-situ for fixed tube sheet bundles and also in case the situation does not allow a bundle to be pulled (heavy contamination on the tube side, requiring process cleaning)
- Robotic cleaning of bundles in wash bays
- Chemical cleaning of bundles by soaking in tank with air, nitrogen, or steam agitation
- Heat exchanger repairs
  - Re-tubing
  - Expanding and welding
  - In-situ machining
  - Shell repairs
  - Plugging
  - Online leak sealing of piping
- Bundle extraction and reinsertion

## YOUR BUSINESS BENEFITS

**Benefit from a holistic approach** – that encompasses every aspect of maintaining and servicing all types of heat exchangers.

**Save time and money** – with our multi-lance system that cleans up to 5 tubes at a time increasing productivity, quality and safety.

**Ensure high safety standards** – by working with a partner that uses advanced automated technology to remove the operator from the line of fire.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy Efficiency, Engineering Excellence, and Sustainable Solutions.**

To learn more, visit [CR3.Group](#)

## CR3 IN ACTION

### The challenge

A refiner in Asia planned to clean 399 heat exchangers within a 21-day window.

### The solution

Using automated tube-side and shell-side high pressure water jetting equipment, we cleaned the tubes up to 5 at a time using flexible and rigid lances, with pumps to 2,800 bar pressure and 250 litres/minute.

### The outcome

The client regained process efficiencies with clean heat exchangers which passed leak and pressure tests at the first time of asking, all within the 21 days schedule.

# CR3

## Waste Handling



### YOUR CHALLENGES

Industrial waste presents a Quality, Health, Safety and Environmental (QHSE) challenge. To minimise these risks, rigorous safety precautions and proper handling procedures are essential.

### OUR WASTE HANDLING

To match these demands, we offer a broad range of waste handling and vacuum truck services, including industrial waste collection and transportation to waste disposal facilities. Our fleet of Supersucker Vacuum Trucks and Waste Bin / Hook-lift trucks are capable of vacuuming and collecting both dry and liquid generated wastes. We have specialised equipment and personnel fully trained in the hazards associated with handling mercury-contaminated materials and have relationships with several licensed disposal facilities for the safe disposal of mercury-containing and other hazardous wastes.

### HOW WE SUPPORT YOUR BUSINESS

Our vacuum trucks and static vacuum units are strategically located so they can react quickly to a call out and are offered on a long or short term basis with 24/7 availability.

We have developed Rover, our multi-purpose, tracked remotely operated vehicle, which works in all conditions including underwater, at high temperatures and in explosive/toxic atmospheres. This robotic solution minimises manned entry to these high-risk environments. Rover is fitted with lights, cameras and is small enough to fit through most access points. It can perform a variety of tasks through the use of different attachments tailored for the specific task.

The versatile nature of Rover allows more areas to be accessed for maintenance and waste handling such as tanks, liquid reservoirs, drainage systems and other such harsh environments.

## THE CR3 DIFFERENCE

CR3's large in-house team of highly trained technicians is subject to regular audits and a stringent safety passport scheme. We invest heavily in the latest equipment and SMART systems to maintain our reputation as the region's leading one-stop provider of specialised maintenance services.

### Advanced equipment and technology

We continually invest in the latest equipment and processes to improve safety and quality standards. Our customers always benefit from having access to the latest solutions. Like Rover, our multi-purpose tracked remotely operated vehicle, designed to minimise manned entry to high-risk environments. Rover enhances safety and improves productivity as it can operate uninterrupted, unlike its human equivalent.

### Outstanding QHSE performance

Our experts follow rigorous safety precautions and proper handling procedures and can provide safe and transparent disposal options that meet all local regulations and environmental requirements.

We are committed to embracing the most advanced technology to improve safety standards and provide significant resources to ensure all staff have the best training available in the industry.

### Unrivalled experience

We pride ourselves on delivering safer, faster and more efficient results. With each operational success, the experience and knowledge gained is channelled into the next generation of solutions.

### Exceptional service

Count on us to provide a multi-skilled, competent and motivated team, supported by high quality systems,

procedures and equipment to meet your ever-evolving requirements. Our commitment to service excellence is underpinned by our integrated approach to safety, quality and the environment as well as our continual investment in developing our people and securing the latest technology available.



## OUR SOLUTIONS

- Vacuum truck and tanker services
- Hazardous liquid transportation
- Sewers drain and pipe cleaning with simultaneous vacuuming
- High pressure water cleaning
- Waste skip and bin rental up to 18 cubic metres
- Mercury monitoring, decontamination and sludge removal
- Road sweeping services
- Wet and dry material vacuuming and collection
- Disposal of non-toxic and toxic wastes
- Temporary storage and tank rental
- Sludge and liquid transfer
- Tank cleaning
- Site clean-up, restoration and reinstatement
- Collection of coal-fired power plant waste such as coal ash, fly ash, bottom ash and boiler slag

## YOUR BUSINESS BENEFITS

**Benefit from a holistic approach** – by using our broad range of waste handling and vacuum truck services, including industrial waste collection and transportation to waste disposal facilities.

**Save time and money** – with our strategically located resources to ensure we can react quickly to a call out.

**Minimise environmental impact** – by working with a partner who maintains rigorous safety precautions and proper handling procedures and can respond quickly to emergency spills and unplanned cleanups.

## CR3 IN ACTION

### The challenge

A gas plant in SE Asia needed to clean their slug catcher for its statutory inspection. Its contaminants included benzene, H<sub>2</sub>S, mercury and radioactive material (NORM).

### The solution

Proprietary chemicals, circulated by both pumping and nitrogen injection, liquified the clay residue and dissolved any mercury and form a sludge which was removed by vacuuming into UN approved drums for disposal.

### The outcome

Over 90% of the contents were removed without the need for confined space entry.

CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy Efficiency**, **Engineering Excellence**, and Sustainable **Solutions**.

**To learn more, visit CR3.Group**

## Leading one-stop provider of specialised maintenance services

CR3 supports your business with extensive contracting experience in the delivery of catered service packages, 'blind to blind' jobs and turnkey maintenance services during major shutdowns and turnarounds. Our business upholds a culture and track record of integrated management systems that are certified to multiple international standards.

## Our Solutions

We offer a comprehensive portfolio of maintenance services that are grouped into six business lines. Our experts deliver these services – onshore and offshore – on time and on budget.

Our complete 'blind to blind' solution ensures more streamlined and efficient projects, as we maintain direct, single-source control of all critical path elements. We cater to projects of widely varying scope and complexity, and can deliver multiple shutdowns concurrently.

### Related services:

- Static & Rotating Equipment Maintenance
- Industrial Scaffolding
- Mechanical Services
- Column Modifications & Repairs
- Total Heat Exchanger Maintenance
- Flare Tip Replacements & Repairs
- Cleaning & Decontamination Services
- Mercury Management Services
- Catalyst Handling Services
- Nitrogen Services
- Waste Handling
- Decommissioning Services
- Insulation Services
- Valve Maintenance
- Storage Tank Cleaning & Maintenance

Our experts meet your demands for shorter change-outs, leaner project teams and superior quality standards for all reactor types with end-to-end solutions that reduce downtime and increase profitability.

### Related services:

- Catalyst & Adsorbent Handling Services
- Tubular Reactor Services
- Dense Loading
- 'Blind to Blind' Mechanical Services
- Reactor Internals Replacement & Repairs
- Nitrogen Services
- Waste Handling

We clean and inspect virtually all plant vessels, columns, drums and piping systems, both onshore and offshore, with services that can be tailored to requirements.

### Related services:

- Pre-Commissioning & Commissioning Services
- Nitrogen Services
- Pipeline Cleaning (Chemical & Mechanical)
- Pipeline Flooding
- Pressure Testing
- Dewatering
- Drying
- Purging

Our investment in training, equipment and SMART systems combined with our focus on safety and rigorous planning, preparation and execution of work underpins our track record as a leading provider of mechanical & plant maintenance services.

### Related services:

- Static Equipment Maintenance
- Rotating Equipment Maintenance
- Specialist Cutting Services
- Online Leak Sealing
- Controlled Bolting
- Reactor Repairs & Maintenance
- Plant Change & Piping Modifications
- In-situ Flange Facing & Machining
- Industrial Scaffolding
- Insulation Services
- Valve Maintenance
- Continuous Plant Maintenance
- Storage Tank Cleaning & Maintenance

Our extensive portfolio of cleaning services sets the benchmark in terms of technical, environmental and safety standards.

### Related services:

- Chemical Cleaning Services
- Mercury Management Services
- Fin Fan Optimisation
- Hydro Jetting Services
- CR3 Decoking Technology (CDT)
- Decontamination Services
- Waste Handling

We deliver projects safely, on time and on budget by ensuring single-source control through our multi-disciplinary approach and project management capability.

### Related services:

- Process Revamps, Rejuvenations & Retrofits
- Construction & Constructability Reviews
- Engineering, Procurement & Commissioning Services
- Operations & Maintenance
- Dismantling, Demolishing & Removal of Equipment
- Fabrication of structural, Carbon Steels & Pipe Systems
- Fabrication of Stainless Steels & Special Alloys
- Installation of Large Equipment & Pipe Systems
- Welding
- Hot & Cold Cutting
- Scaffolding & Insulation



CR3 is a leading provider of energy engineering solutions. Established in 1991, we provide specialised maintenance, plant upgrade, revamp and engineering services with a sharp focus on **Energy** Efficiency, **Engineering** Excellence, and Sustainable **Solutions**.

### Contact us today to learn more

#### CR3 Group

21 Church Street  
Capital Square Two, #02-01  
Singapore 049480

Email: [cr3g@cr3.group](mailto:cr3g@cr3.group)

#### CR3 Thailand

15/1 Moo 3, Bankoh - Mabkha Road  
Mabkha, Nikompattana  
Rayong 21180, Thailand

Tel: +66-38-698-399  
Fax: +66-38-698-398  
Email: [cr3t@cr3.group](mailto:cr3t@cr3.group)

#### CR3 Malaysia

P.T. 6068, Teluk Kalong Industrial Area  
24000 Kemaman  
Terengganu Darul Iman, Malaysia

Tel: +60-9-863-2325 to 26  
Fax: +60-9-863-2328  
Email: [cr3m@cr3.group](mailto:cr3m@cr3.group)

#### CR3 Singapore

156 Gul Circle  
Singapore 629613

Tel: +65-6268-0255  
Fax: +65-6268-3369  
Email: [cr3s@cr3.group](mailto:cr3s@cr3.group)

#### CR3 (India) Private Limited

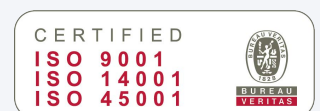
601, 6<sup>th</sup> Floor, Building No. 9, Gigaplex  
Plot No. IT-5, Airoli West, MIDC  
TTC Industrial Area  
Navi Mumbai 400708, India

Tel: +91-22-6288-1000  
Email: [cr3i@cr3.group](mailto:cr3i@cr3.group)

#### CR3 Middle East

Musaffah, M19  
Plot #1 DSV Solutions  
Abu Dhabi, UAE  
PO Box 132569

Tel: +971-2-583-4228  
Email: [cr3me@cr3.group](mailto:cr3me@cr3.group)



The logo consists of the letters 'CR3' in a bold, sans-serif font. The 'CR' is colored green, and the '3' is black.

**CR3.GROUP**



ENERGY | ENGINEERING | SOLUTIONS