

THERMOFOR CATALYTIC CRACKING (TCC)
TOWER DECONSTRUCTION

A 'CRACKER' OF A CRANAGE CHALLENGE FOR A MAJOR OPERATIONAL OIL REFINERY

AT A GLANCE

CLIENT	UNDISCLOSED
PROJECT	THERMOFOR CATALYTIC CRACKING (TCC) TOWER DECONSTRUCTION
LOCATION	AUSTRALIA
SECTOR	OIL & GAS
DATE	JULY 2017-JANUARY 2018

CRANES	1 X M2480D
ENGINEERS	2
INSTALLATION CREW	6
OPERATIONAL CREW	1
MAINTENANCE CREW	1



Constructed in the 1950s, the Thermoform Catalytic Cracking (TCC) tower at this major oil refinery was the first of its kind in Australia. Originally developed to produce aviation fuel to support the Allied Forces during World War II, the cracking technology used changed the refining industry by allowing the production of 100-octane aviation fuel in large quantities.

The TCC operated from 1955 until it was decommissioned to make way for newer, more efficient technology in 1997. In recognising that the degrading structure could be a potential risk to the surrounding live refinery, in 2016 the decision was made to deconstruct and remove the TCC from the site.

The big question was how to do it safely and without disruption to the refinery's production capacity – and that's where Marr's team came in.



The new system we developed for this project is a game changer for refineries around the world where safety and productivity are critical to successful ongoing operations.

**SIMON MARR, MANAGING DIRECTOR,
MARR CONTRACTING**



THE CHALLENGE

Operating 24 hours a day, 365 days a year, the refinery processes crude oil into up to 14.5 million litres of refined petroleum products, including aviation fuel, every day.

The TCC was located at the heart of a live refinery with over 350 employees on-site, so it goes without saying that safety and the need to keep the refinery open and operational during the deconstruction were paramount considerations in the planning of the job.

Heavy lifting over a live refinery is a delicate operation at the best of times but given the height of the TCC (at 100-metres), as well as the fact that the structure was located in a high-wind area with tight access, the project posed a number of challenges.

Traditional deconstruction methods would have involved the use of a large crawler crane and required shutting down critical production within the refinery during its assembly and disassembly. However, with our client wanting to avoid any potential safety hazards or disruption to productivity, the challenge was to come up with a craneage solution that would fit into the limited area available and was able to dismantle the structure safely without any disruption to daily production target or threats to people and property on the site and surrounding suburbs.

OUR SOLUTION

Working with a team of highly experienced engineers and industrial deconstruction and decommissioning experts assembled by the client, Marr designed a craneage solution to safely dismantle the TCC using a new system that would become a game changer for other heavy industrial refineries where productivity and safety are critical to ongoing operations.

The mechanical deconstruction of the 100-metre high TCC tower had to take into account the fact that the 'cracking' process used for over 40 years had weakened the TCC structure.

Key to our strategy was the use of one of our Marr 2480D Heavy Lift Luffing (HLL) cranes to dismantle the tower elements in large manageable pieces and minimise the risks associated with working with limited space on the ground and at heights in exposed, windy conditions that are prevalent in the area.

As the significant in-ground services meant that excavation to install a crane pad was not an option, we designed a solution that allowed us to stand our crane on an above-ground static base using the Marr Crane Mat System configured to meet the existing allowable ground-bearing pressures of the site.

We erected the M2480D at a low-level within a 10x10-metre footprint and then self-climbed it to a height of 65-meters above existing ground. With the 55-metre boom installed in the crane we had a 125-metre hook height, which gave us significant clearance over the 100-metre TCC. In this configuration the crane was rigged to have a capacity of more than 280 tonnes at the highest point of the TCC, allowing a 50 percent safety factor on the engineered weights we were to lift.

The large lift capacity of the crane at that height meant it gave our client the option to remove the TCC in larger sections. The initial stage of the TCC demolition included completing a 125-tonne lift to dismantle a 10x4.6-metre diameter surge separator vessel located at the top of the 100-metre tall tower. The largest lift on the project involved removing a 193-tonne concrete section which was saw-cut out of the overall structure.

Specialised engineering studies were also carried out across different phases of the deconstruction to ensure the structure remained stable at all times.

On completion of the project six months later, the crane was removed from the project in the same method it was installed.

THE RESULT

Without having to shut any part of the refinery operations down during the deconstruction works, our approach meant less lifting and a quicker deconstruction program, which effectively reduced overall risk on the project and to refinery operations.

The project was also completed without incident, ahead of time at a substantial cost-benefit, over a traditional demolition process using a large crawler crane.

Members of the TCC demolition project team were also recognised for multiple safety and innovation awards that celebrate innovation, efficiency and reliability in the energy sector.

Looking ahead, the use of this new craneage technology is a game-changer for other large-scale refineries worldwide. The methodology we used on this project can be adapted for any large-scale operation where there is limited space to work at the interface of other working fronts, with a similar need to avoid non-scheduled shut-downs of operations.

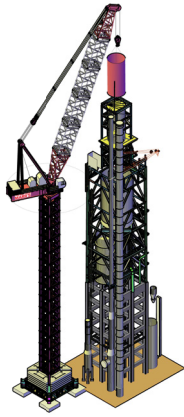
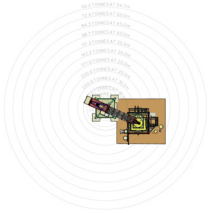


We provided a new solution that eliminated disruption to our client's refining activities. The craneage solution we developed with our client's team enabled the works to be completed without incident, ahead of their original program time and at a considerable cost saving to the refinery, especially compared with other more traditional options.

**SIMON MARR, MANAGING DIRECTOR,
MARR CONTRACTING**



01 / START >



In 2016 Marr's team was contacted to develop a craneage solution for the deconstruction of a decommissioned Thermoform Catalytic Cracking (TCC) tower at a major oil refinery. Built in the 1950s and decommissioned in 1997, the 100-metre high tower had been weakened by the 'cracking' process during its 40-year operational history.

02 >



After 18-months in the planning, we commenced onsite works with the installation of one of our M2480D Heavy Lift Luffing (HLL) cranes. Without the option to install a crane pad, we designed a solution that allowed us to stand our crane on an above-ground static base using the Marr Crane Map System configured to meet the existing allowable ground-bearing pressures of the site.

03 ✓



The M2480D was erected at a low-level within a 10x10-metre footprint and then self-climbed to a height of 65-metres, above existing ground.

05 ✓



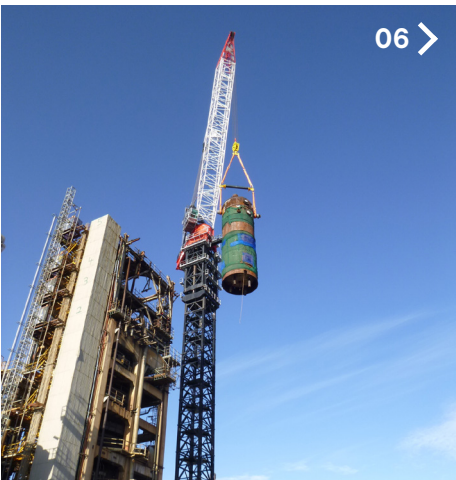
The first 125-tonne lift removed a 10 x 4.6-metre separator vessel located at the top of the tower.

04 <



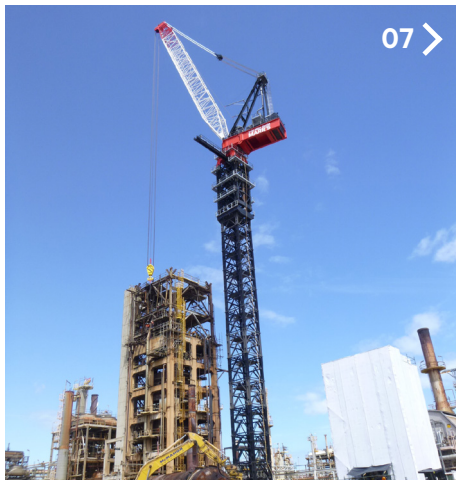
With the 55-metre boom installed in the crane, we had a 125-metre hook height, which gave us significant clearance over the 100-metre TCC. In this configuration the crane was rigged to have a capacity of more than 280 tonnes at the highest point of the TCC, allowing a 50 percent safety factor on the engineered weights we were to lift.

06 >



Other lifts included the removal of redundant, heavy vessels weighing over 150-tonnes.

07 >



The heaviest lift was a 193-tonne concrete section which was saw-cut from the base structure of the cracker support structure.

08 / FINISH —



On completion, the M2480D was dismantled using a mobile crane.