German coatings specialist Ceramic Polymer is supplying its Proguard epoxy coating for hot refurbishment of a leaking 90km oil pipeline in Iran – its largest pipe coating project to date

Ceramic Polymer provides hot solution for Iranian pipeline

Main image: Application of Proguard CN100iso epoxy coating to the Abadan/Bandar Mahshar pipeline while still operational in Iran. The steel pipeline surface exceeds 60˚C

Germany-based Ceramic Polymer secured a contract to supply its Proguard CN100iso epoxy coating for a major refurbishment of the 90km steel pipeline that links the Abadan oil refinery in Iran with the port of Bandar Mahshar. It is the company's largest ever pipeline coating contract and was secured, says Ceramic Polymer director Matthias N Roehl, because of the resin's suitability for application to substrates at operating temperatures of up to 90˚C.

Owned by the National Iranian Oil and Refining Distribution Company (NIORDC), the Abadan refinery is one of the largest in the world with a claimed capacity of around 430,000 barrels/day of crude oil. The pipeline linking it to the Gulf port of Bandar Mahshar was installed around seven years ago. However, the extreme operating conditions – the oil temperature at the inlet is around 90˚C cooling to 60˚C at the outlet while ambient daytime temperatures are frequently in the 50-60˚C range – had caused substantial shrinkage of the original polypropylene (PP) corrosion protection wrapping.

This shrinkage exposed large areas of steel in the buried pipeline to the highly corrosive damp sabkha soil, with the result that many leaks had developed along its length. Repair was essential but with no wish to shut down the pipeline, owner and operator Iranian Oil Pipelines and Telecommunications Company (IOPTC), a subsidiary of NIORDC, required a repair system that could be implemented at operational temperatures.

Ceramic Polymer's Proguard CN100iso system is a high performance two-part epoxy originally developed for application to pressure vessels operating at pressures of up to 100bar and temperatures of up to 150˚C. It is a solvent-free system based on unplasticized Novolac hybrid resins offering a Tg value of greater than 120˚C – allowing it crosslink even when applied to high temperature substrates.

The coating is capable of withstanding continuous dry operating temperatures up to 170˚C and intermittent operation to 190˚C, while the incorporation of micro-sized ceramic particles in the coating enhances

Proguard CN100iso external pipe coating performance

		Units/Test	Values
Design lifetime	>50 years	Salt spray ASTM B117	>25,000 hours
Abrasion resistance	Good due to ceramic particulate filler	ASTM D4060	Abrasion loss 10-12mg
pH resistance	1.5 – 14		
Max operating temperature (dry)	170˚C continuous/190˚C intermittent		
Max operating temperature (wet)	150˚C continuous/170˚C intermittent		
Primer	None required, high adhesion to steel	ISO 4624	34-37 N/mm^2
System thickness	1.0-1.5mm		
Cathodic Protection	Good	ASTM G8 ASTM G 95 87(98) API RP5L7	 0.0mm disbonding. No blisters

Source: Ceramic Polymer

its resistance to abrasion. The coating offers an adhesion value of greater than 27 N/mm^2 according to ISO 4624 and complies with ISO 10290 requirements and the local Iranian Pipeline Standard IGS-TP-016.

"No other paint manufacturer could offer a coating which was capable of being sprayed onto the hot surface. For IOPTC there was no option other than using our system if the pipeline was to be kept hot. The alternative would have been to shut-off the pipeline for six months and apply a paint system as usual onto a cold surface," says Roehl.

"Normally the CN100iso product is not really competitive in cost against the standard cold-surface applied external pipeline paints that are made by many others, but in this special case in Iran we won the job since the conditions were so severe and extraordinary," he says.

The refurbishment project is being carried out by Azerbaijan-based contractor Eibak Azer. It involves excavating sections of the pipeline, removing the PP wrapping tapes and repairing leaks by welding on steel patches. The repaired pipeline is then grit blasted and the Proguard CN100iso coating applied using a Graco X70 airless spray pump. No primer is required.

The CN100iso system is delivered to the site in the required 10:1 ratio of base to hardener ready for mixing and application. A 1.5mm DFT layer is built up by the application of several wet-on-wet coats. The coating is touch-dry within 30 minutes. "The pipeline itself is between 60˚C to 90˚C. That is hot enough to cure the coating very fast," says Roehl.

More than 10km of the pipeline has already been repaired. Ceramic Polymer says more than 80 tonnes of the Polyguard CN100iso coating has been supplied to date; the entire six month project is expected to consume around 700 tonnes. The company has guaranteed the coating for a period of 25 years.

Alhough this is Ceramic Polymer's first long length pipe coating project, Roehl says the company is not unused to the requirements of the pipeline industry. "We have not done a big external long pipeline job before, but have done some special pipe jobs like 'slug-catchers' for Oman Gas, NIGC, Descon Pakistan, etc. These were internal high-pressure natural gas pipeline jobs," he says.

The company also offers a two-pack polyurethane system for standard external pipeline work that complies with ISO 10290 and the IGS-TP-016 Iranian standard. This system – Cerapur 9531 – is claimed to cure in as little as three minutes, making it suitable for serial external pipe coating application in factories and pipe-coating plants.

Cerapur 9531 is also a solvent-free formulation and like the Proguard CN100iso product it also contains micro-sized ceramic particles to enhance abrasion resistance. Ceramic Polymer claims the 9351 grade provides an abrasion resistance rating of excellent (75mg loss) in ASTM D4060 testing.

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Below: The old PP wrap is scraped away prior to repair, blasting and coating with the Ceramic Polymer epoxy while the pipeline remains in operation