Condition of firemains

Allowing Huntsman to rehabilitate their firemain over several years with no negative impact on cost and performance.

Fire-fighting capacity at this petroleum-licensed site is provided by a comprehensive pipework system. It comprises some 16.5km of pipework in a variety of materials which include carbon-steel (31%, over 5km) and cast iron (18%, almost 3km).

The system is supplied with water from two sources: from a storage reservoir via Northumbrian Water’s, 33” diameter, raw water main, and from the River Tees. Pumps raise the water’s pressure to c.150psi (10.3 barg).

Parts of this system were 40 years old and there had been some deterioration in the pipework, which had resulted in pipe bursts. There had also been a suspected reduction in delivery pressure from internal rusting and consequent increased roughness in the ferric pipes. It was further suspected that corrosion had been exacerbated locally by routine testing of the jetty pumps with injected saline estuarine water into the system.

Huntsman needed to understand the system’s likely reliability and hydraulic capacity. They also wanted tools to permit them to design and estimate the cost of any remedial works needed. This included the facility to appraise options.

ABB were asked to carry out a study to achieve this.

“Inclement weather caused access problems at times and, without the new method of pipe insertion, the task would have taken weeks rather than days. I was most impressed with this no-dig method of repair and would recommend it for the replacement of extensive lengths of pipes on firemains in future.”
Solution
The study was required to:

- Determine the condition of the pipes and their remaining useful life
- Assess the system's existing capacity to deliver firewater to various parts of the site. Data gathered would be used to develop and calibrate a hydraulic model of the recirculation system
- Consider the likelihood of dynamic pressure transients (‘surge’) to cause damage
- Propose remedial works to meet design requirements

It included:

- Preparation of an inventory of all pipes on the site, listing location, original specification and age
- Gathering of existing data on pipe thickness from burst records etc. Also the measurement of the thickness of ferric pipes by sampling cast-iron pipes and by non-destructive testing (NDT) of carbon-steel pipes
- Analysis of the data to determine the rate of loss of thickness (in microns per year) and the remaining life to a calculated minimum thickness. Plotting the former confirmed the suspicions regarding the jetty pumps (see plan)
- Refurbishment, by no-dig techniques, of two lengths of main found to be in urgent need of repair
- Development of an estimate for the rehabilitation of the system's pipework
- Development of a scheme to improve existing surge protection equipment
- Development of a scheme to inhibit the injection of saline water to the system during routine testing of jetty pumps
- A series of full-scale pump tests to demonstrate the system's existing capacity. Data on pressures and flows were gathered and used to calibrate a hydraulic model which we designed during the study

Benefits
- Reliable fire fighting capability retained
- Huntsman now have a tool enabling them to plan rehabilitation work over several years with estimated costs
- Deficiencies in supply capacity were highlighted and remedial works can be optimised by using a hydraulic model