Gas from a number of newly developed offshore wells is now being received at the client’s gas processing facility. At 160,000 ppm (16%) the levels of salt within this gas plus liquids far exceed the design levels for the processing train.

The client was concerned that the integrity of the equipment was being compromised by an accelerated rate of internal chloride driven corrosion, drastically reducing the operating life of the vessels and pipework.

The client required an investigation to be undertaken rapidly to identify the immediate actions required to manage the situation in the short term. They also required a longer term plan to identify and specify any necessary equipment replacements in time for the equipment to be designed, procured and installed prior to the existing equipment becoming inoperable.

The client turned to ABB to address the situation and enable this part of the terminal to continue to process gas. The client had previously used ABB and knew that we had a depth of specialist consultants with a track record of pragmatically addressing materials engineering and corrosion issues in operating plant.

**Solution**

One of ABB’s experienced materials specialists led the investigation drawing upon his accumulated knowledge and experience of in-service corrosion of similar equipment. Being able to provide a technically based rationale for the way forward was important in gaining the agreement of the stakeholders.

The work involved:

- An initial ‘fast track’ review to identify any potential short term issues for the materials of construction due to the high chloride concentration
- A detailed review of the materials of construction specifications of the equipment
- Examination of the inspection records of the equipment.
- Estimation of the likely corrosion rates due to the high level of chlorides present
- The identification of the parts of the pressure envelope most susceptible to deterioration
- The application of specialist technical knowledge and previous experience
- The formulation of a plan to manage the corrosion issues
- Undertaking a Risked Based Inspection (RBI) review of the equipment

ABB’s materials engineering specialists enable the operator of a major gas processing facility to continue to process gas with a high level of entrained salt.
The investigation identified that:

- Stainless steel equipment was at the most significant risk in the short term. The items included heat exchanger tubes, thermowells, plate heat exchangers and flow measuring equipment, which were susceptible to localized chloride attack in the form of pitting, stress corrosion cracking and crevice corrosion.
- Chlorides at 160,00 ppm were expected to cause accelerated internal corrosion of carbon steel vessels and piping, which would in turn reduce the operating life of the equipment.
- For stainless steel critical items, a change in the materials specification from 316L to titanium or Hastelloy C-276 was necessary to provide resistance to chloride attack and thus ensure the equipment is suitable for the duty.
- For the carbon steel the review recommended an increase in inspection frequency in the earlier years of operation. This was mainly non-invasive using UT thickness measurements at regular intervals to provide a corrosion rate, which would give a life expectancy for the equipment.

In summary, the solution has required:

- Changes to the written schemes of examination
- Increased inspection of the equipment in areas identified as vulnerable to internal corrosion
- The procurement of new equipment of higher specification metallurgy so that it can be ready for installation before the existing equipment deteriorates to the extent that it is no longer fit for service.

ABB is working with this client and other oil and gas industry clients to manage the ongoing integrity of their equipment in challenging operational and technical circumstances by providing materials engineering and other specialist technical consultancy.

Benefits

- ABB’s investigation enabled this facility to remain in operation and the wells to remain in production.
- The inspection schemes and written schemes of examination were revised to assure the continuing integrity of the equipment.
- Modifications to enable longer term (safe and reliable) operation were identified.