

Grayloc® Connectors Survive High-Pressure Hydrogen Fire with Sealing Integrity Intact



A gas leak caused a small but intense fire in a large petrochemical facility where Grayloc® connectors were used throughout the system. During the post-incident inspection, it was established that the connectors maintained their sealing integrity despite exposure to extremely high temperatures estimated at between 2,000°F and 3,000°F (1,090°C and 1,650°C).

The gas leak, traced to an external packing gland, occurred in the hydrogen processing unit, which contained 80% hydrogen gas operating at 6,000 psi (414 bar) and 500°F (260°C). At this pressure and temperature, hydrogen gas will auto-ignite when exposed to atmospheric conditions.

Grayloc® connectors are commonly used in critical service applications. This meets the operating criteria of high-pressure and high-temperature applications and the requirements for leak-free functionality that are provided by our metal sealing technology. Grayloc® connectors were used throughout the entire hydrogen processing piping system, and the system's valves incorporated Grayloc® ends. The majority of the connectors had carbon steel hubs, clamps, and bolting, and included stainless steel seal rings (AISI 630).

The photograph shows the level just above the leaking valve packing gland, within 15 ft (4.5 m) of the main reactor vessel. The intense heat destroyed three control valves; their operator housings were melted and their control functions were completely lost. These valves, installed with Grayloc® connectors, were within 2 ft (.6 m) of the melted operators.

The Grayloc® clamps provided the only structural support for the valves, and close inspection revealed that the connectors neither leaked nor loosened.

No pipe connector can be guaranteed to survive extreme temperature exposures, as detailed above, but this experience has demonstrated that Grayloc® connectors provide extra margins of structural safety over bolted flange piping connectors. If a bolted flange was used, the excessive heat would have likely resulted in bolt relaxation and a subsequent leak. The nature of the Grayloc® clamp configuration meant it was less likely that a preload on the joint would be lost. A conventional seal would have been more likely to leak when compared to the self-energized, pressure-enhanced Grayloc® seal. The customer expressed satisfaction with the integrity of the Grayloc® connectors post-incident.

The customer was also able to reduce the downtime and expense required to replace and repair fire-damaged system components, based on the Grayloc® connectors' ease of disassembly and reassembly. Most importantly, the customer avoided catastrophic results, as the Grayloc® connectors prevented a leak from occurring, thus thwarting any potential knock-on effects of the incident.

