

# Taking Hydrogen valve lifetime from 3,000 hours to 48,000 hours



## History

This customer operates two Nuovo Pignone 4HE/2 compressors, operating with 8 Bar suction up to 69 Bar discharge across 2 stages.

The original OEM plate valves had an MTBF of approximately 3,000 hours.

In 1997 the customer became aware of CPI Hi-Flo RD valves and the problems they were starting to solve, so provided CPI with the opportunity to upgrade to this style of valves.

Following the initial upgrade, the MTBF increased to around 8,000 hours, failure modes included:

- Broken springs
- Premature button wear
- Disc breakages

Even with the lifetime more than doubled, CPI sought to increase this further.

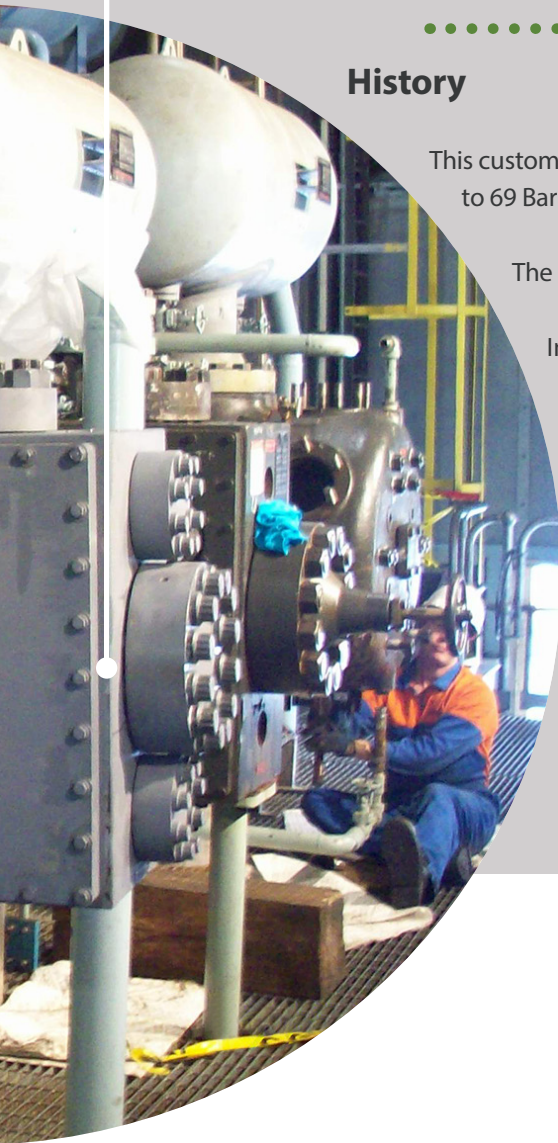


Fig.1 - CPI Hi-FloTM RD valves after 4 years in service

## The Solution

Then over the subsequent years right up to today (November 2022) incremental improvements have continued to be made. These started with changes to both the lift and the springing of the valves, made possible through the modelling of the valve performance using CPI's Valve Dynamic Analysis (VDA) software, these initial changes saw the MTBF increase to around 24,000 hours.

Then upon examination after 24,000 hours during the valve reconditioning process it was observed that excessive valve spring button wear had been experienced. At this point CPI upgraded the buttons to carbon fibre reinforced which further improved lifetime to 48,000 hours.

The most recent inspection has highlighted some fatigue failure of the valve springs, Hastalloy had been selected due to the H<sub>2</sub>S content, laboratory testing confirmed CPI's analysis. Further VDA studies have since been conducted to further improve the valve motion, resulting in an increased number of spring elements being proposed to better share the loads and reduce the stress.

An incremental increase of the valve lift has also been proposed to improve the power losses, but to not compromise the reliability. Part of this latest proposal includes moving to Elgiloy valve springs to improve fatigue and cope with the corrosive nature of the valve discs.

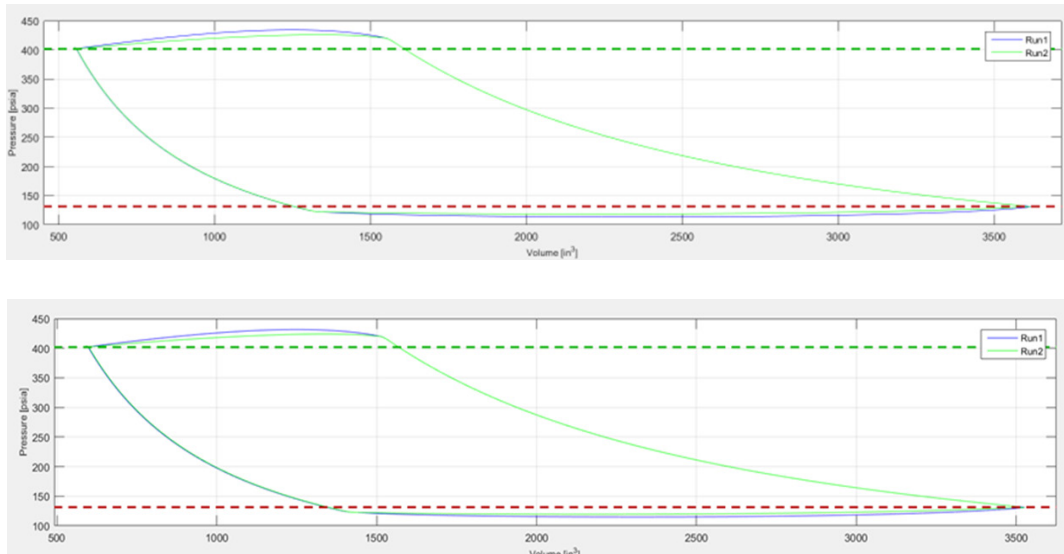


Fig.2 - VDA output following lift increases = reduced pressure drop/power loss