

## Case Study

Hydrogen compressor re-build

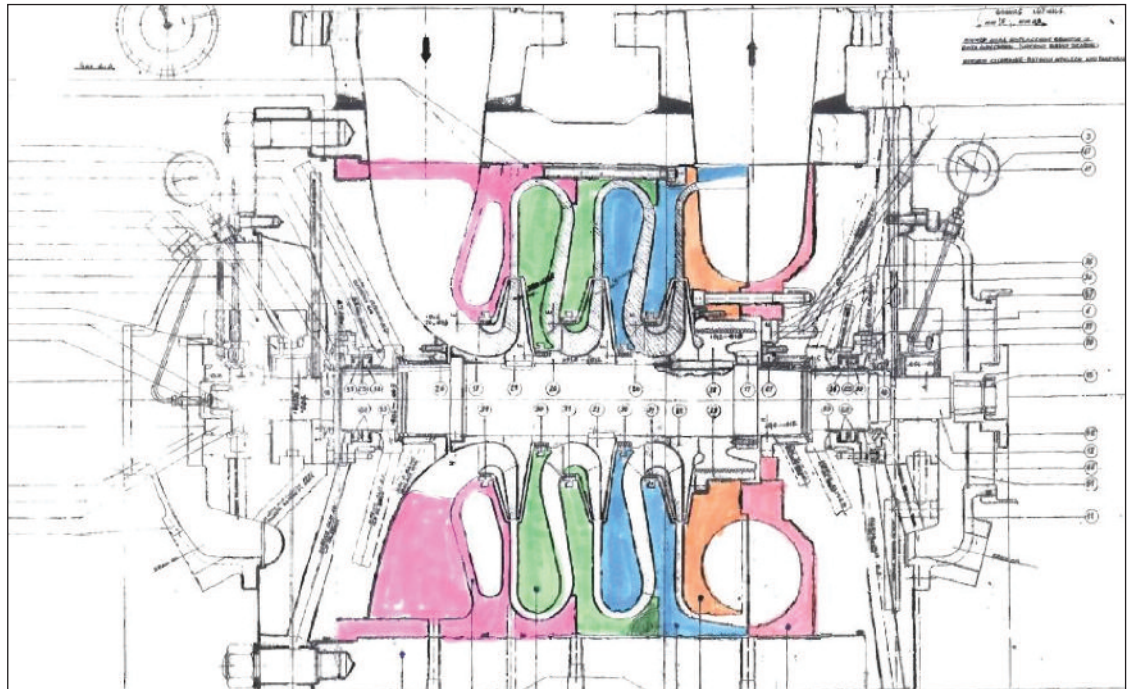
# Major restoration of Nuovo Pignone BCL 353 hydrogen compressor successfully completed in seven months



Each of the cast components had cracks as severe as that shown in this photograph.



Once the bundle was removed from the case, the outside of the return channels broke clean away from the diaphragms.



The sectional view highlights the new parts that were manufactured by Weir Turbomachinery.

### Scope

Our customer approached us with the formidable task of re-engineering a completely new compressor bundle using severely damaged parts as patterns.

A previous explosion in the suction pipework had cracked all of the static cast iron aero components rendering the compressor inoperable.

A key benefit to our customer was the very short delivery time we could offer to manufacture the new components and rebuild the compressor.

### Engineering excellence

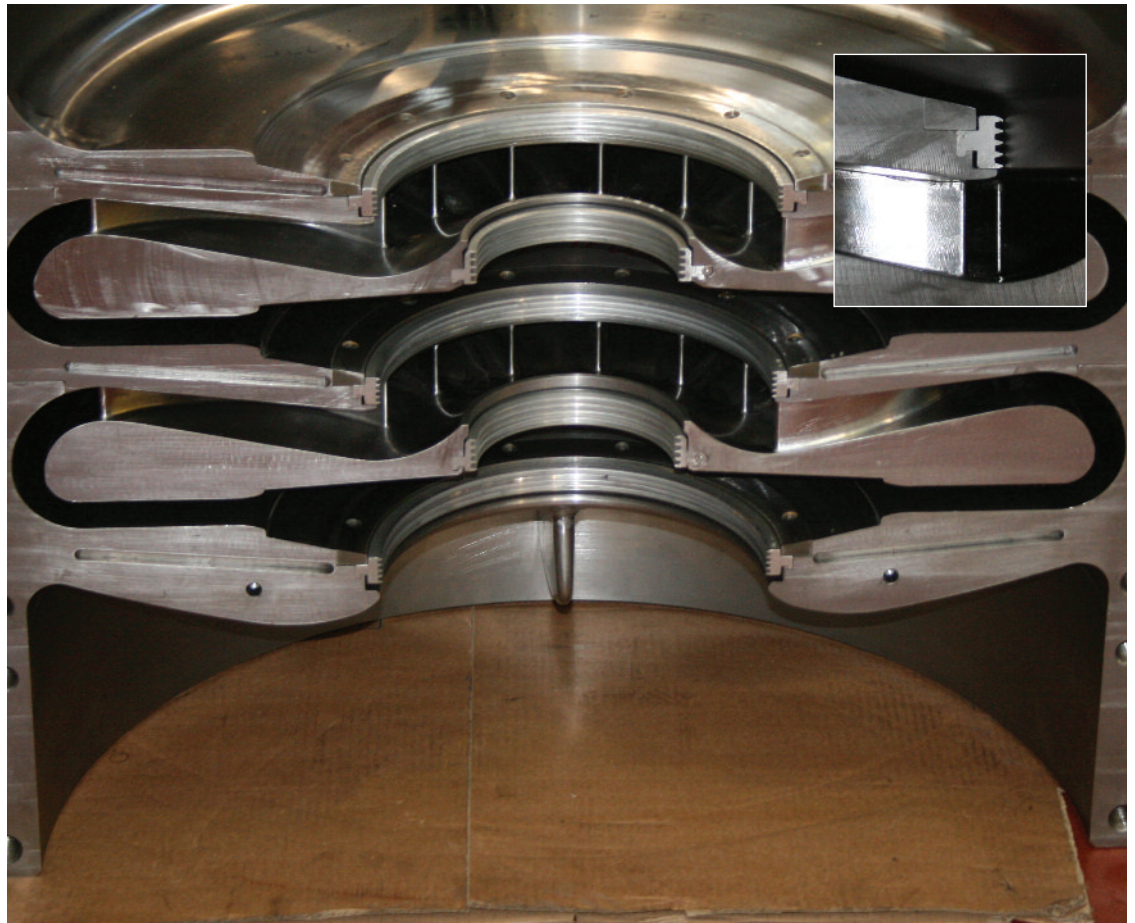
The compressor bundle and barrel, along with a spare rotor, were air-freighted from the Philippines. The old parts were measured, new parts were produced and the compressor was rebuilt in the UK before return.

The old parts were scanned using a 3-D coordinate mapping machine and then the contours of the parts were digitally adjusted to compensate for the distortion resulting from the explosion.

The original diaphragms were cast iron. To improve the delivery time, Weir Turbomachinery machined each diaphragm half in two parts from solid plate steel. The complex vane profiles were machined on one part using 5-axis milling and then the corresponding part was bolted to it through each vane to close the gas passages.



*The compound curves of the discharge volute were achieved using 5-axis milling techniques.*



*One half of the new bundle during final assembly.*

*Once returned to the customer's site, one of our compressor engineers oversaw the successful commissioning of the overhauled machine.*



The photograph (above with inset photo) clearly shows the superior surface finish achieved within the gas passageways by 5-axis milling rather than casting.

Whilst creating the machining drawings of the new parts, some improvements were made to the original 1971 design:

- Split-line O-ring grooves were added to one half of the diaphragms for improved inter-stage sealing
- The containment of the labyrinth seals was upgraded by incorporating a separate clamp ring to make removal of the labyrinths easier in the future. (See insert photo)

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