Minimum Platform Downtime
Upstream compressor revamp
Two identical, gas-turbine-driven barrel compressors type RB 35, installed on an oil production platform in the Gulf of Mexico, have been retrofitted from 8 to 9 stages. The conversion was necessary in order to compensate for a pressure decrease in the partially depleted oil reservoir.
Project goals
The two compressor units, originally installed in 1998, are each directly driven by a gas turbine via a flexible coupling. Due to decreasing oil reservoir pressure since production was started, an increase in the unit pressure ratio was required in order to accommodate the changing process conditions and to maintain the original production levels. The main requirements of the customer according to the original enquiry were as follows:
- outer casings and the external piping interfaces were to be retained.
- the project, including installation and re-commissioning, was to be completed within a maximum of seven months from the award of order.

The MAN PrimeServ solution
A first, preliminary on-site assessment indicated that the required pressure ratio increase could only be achieved by increasing the number of stages from 8 to 9. As the RB 35 compressor had never been built with more than 8 stages at that time, exact technical feasibility investigations were necessary in advance.

The complete feasibility study, detailing the exact modifications required to accommodate the additional stage, as well as the resulting thermodynamic and rotordynamic studies, was conducted and presented to the customer.

In preparing the study, particular importance was attached to retaining as many of the original components as possible in the conversion. This was necessary not only to complete the work in the specified time window, but also to keep costs as low as possible. A major contribution in this context was the possibility of retaining one of the original dry gas seals in the modified design. This approach also allowed the customer to retain a large part of the available spare parts inventory.

Project results and customer benefit
In particular, the extremely tight schedule required exact planning and project management. Additionally, the market price for crude oil increased substantially during the order processing period, thus creating even more pressure to have the units modified and back online as early as possible.

By retaining the compressor outer casings and also all connecting pipework, structural modifications to the platform layout were largely eliminated and production outage, with corresponding revenue losses, was reduced to a total of only 8 days for both compressors. Most of the available spare parts, purchased with the original order, were retained for use with the revamped units.

The two new bundles were ready for dispatch some four weeks ahead of the original schedule. Two weeks later, following transportation to the platform and installation, both units reached “full load” commercial operation.

The conversion of the two compressors provides the operator with a very cost effective and long-term solution to the problem of decreasing oil reservoir pressure.

The customer expressed complete satisfaction with MAN PrimeServ’s handling of the complex technical conversion and the professional project management. Additionally MAN PrimeServ received a follow-up order from the customer for a similar conversion project which has already been completed.
Outer casing of RB 35 compressor (cartridge removed)

Before revamp – original RB 35 compressor cartridge with 8 stages

Assembly of the new 9-stage compressor cartridge

After revamp – refurbished and upgraded RB 35 compressor cartridge with 9 stages

Compressor completed with 9 stages
Technical Data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power at compressor coupling</td>
<td>6,480 kW</td>
<td>7,274 kW</td>
</tr>
<tr>
<td>Volume flow (max) Nm³/h</td>
<td>159,295</td>
<td>132,000</td>
</tr>
<tr>
<td>Suction pressure bar</td>
<td>52</td>
<td>35.5</td>
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<tr>
<td>Discharge pressure bar</td>
<td>132</td>
<td>118</td>
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<tr>
<td>Speed rpm</td>
<td>8,500</td>
<td>9,100</td>
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<tr>
<td>Molecular weight kg/kmol</td>
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<td>20.03</td>
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</tbody>
</table>

Increased pressure ratio after revamp with one additional compressor stage
All data provided in this document is non-binding. This data serves informational purposes only and is especially not guaranteed in any way. Depending on the subsequent specific individual projects, the relevant data may be subject to changes and will be assessed and determined individually for each project.

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