Steam Turbine Revamp
Conversion to back pressure design
In order to realize energy optimization measures, MAN PrimeServ has converted an existing DK063/080 condensing steam turbine into a DG063/080 back pressure steam turbine.

**Objective**
As a result of changed operational requirements and in order to achieve a number of energy optimization measures, MAN PrimeServ was commissioned to undertake a detailed engineering study investigating the possibility of converting an existing condensing steam turbine into a back pressure steam turbine with design parameters provided by the customer. The condensing steam turbine DK063/080 was installed in 2007 during a modernization project as a replacement for a less powerful condensing steam turbine.

According to the framework specified by the customer, the conversion of the steam turbine was to be performed within a four-week period during a planned plant shutdown. In addition, as many components as possible were to be re-used in the converted machine.

**Modernization Solution**
In order to investigate the feasibility of the conversion of the condensing steam turbine to a back pressure steam turbine with the specified design parameters, MAN PrimeServ performed extensive thermo-dynamic and mechanical design re-assessments. In particular, the design of the rotor blading, the turbine casing and the internals, the structural strength and the dimensional stability for stationary operation, as well as the feasibility in terms of mechanical, design and time aspects were investigated and verified using the finite element method.

Based on the results of the engineering study, MAN PrimeServ defined the measures necessary for the modification as well as for compliance with the envisaged timescale in a detailed conversion concept. After careful investigation, the customer decided to award the order for the conversion project to MAN PrimeServ in line with the proposed concept:

- Modification of stages 3 and 4 of the live steam valve
- Conversion of the control stage to a single-row impulse wheel
- Removal of the low-pressure stages including the corresponding adaptation of the spare rotor
- Modification of the shaft seal system
- Extension of the insulation to the outlet area
- Adaptation of the control system
- Supply of a spare parts package for multi-year operation

**Summary**
With the conversion of the existing DK063/080 condensing steam turbine to a DG063/080 back pressure steam turbine, it was possible to achieve the operating parameters specified by the customer and thereby to realize the associated energy optimization measures. The timescale of just four weeks available for the conversion – thereof one week for the disassembly and reassembly of the steam turbine and three weeks for the performance of the actual conversion – required a detailed project preparation and an extremely intensive project management on the part of MAN PrimeServ.

With the early manufacturing and supply of the new components required for the conversion and the reworking of reserve parts as the spare rotor and the stuffing boxes on the inlet and outlet side, MAN PrimeServ was able to exclude possible bottlenecks during the preparation phase. By retaining the external casing it was possible to retain the existing unit design without major changes and therefore to further minimize as well the conversion time as the conversion costs.