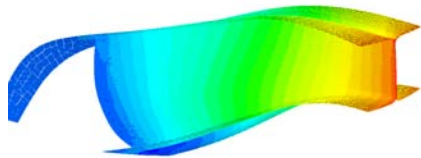


Client: TrustPower Ltd
Location: Coleridge, New Zealand
Scope: Replacement runner, seals, wicket gate wear plates and refurbishment of head covers and turbine shaft.
Head: 141.5 m
Discharge: 3.2 m³/s
Output: 4,000 kW
Commissioning: 2008

DESIGN AND MANUFACTURING

Hydroworks was commissioned by TrustPower Ltd to redesign the two 1922 Escher Wyss Francis turbines at Coleridge power station to improve their efficiency and service life. The new runner was designed using computational fluid dynamics and the runner stresses were analysed using finite element analysis.



Left: pressure distribution used for the stress analysis of the runner blades.

The turbine was recommissioned after installation and alignment of the refurbished parts.



Left: G8 after completion of refurbishment.

TrustPower Ltd then stripped the turbine and sent it to Mace Engineering for refurbishment.



Redesigned martensitic stainless steel runner.



Original cast steel runner



Below: The adjacent G9 turbine in its original condition.

OPERATION



G8 weir level at 3,000 kW

G8, the first of the two turbines, was returned to service in March 2008.

The top photos show the tailrace of G8 after refurbishment and the bottom photos show the identical G9 unit which is yet to be refurbished. Both units are at the same power output of 3,000 kW.



G8 tailrace at 3,000 kW



G9 weir level at 3,000 kW

The tailrace of G8 shows significantly less turbulence and a lower weir level (4.0 and steady versus 4.4 and fluctuating between 4.0 and 5.0). The difference in weir heights equates to a reduction in flow of 12% at the same power output.



G9 tailrace at 3,000 kW

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