

Case Study:
Structural integrity of a cooling water impeller

Problem

In order to test the integrity of their cooling water impeller, the end customer was required to manufacture a scaled down version for trials. This was a multi-staged assembly with the rotors welded in place. The original test model was failing prior to reaching the required flow rates and pressures. This was occurring due to weld failure on the rotor blades. If the customer could not replicate the pressures, they could not effectively guarantee the larger final production component would work. The production part was a significant investment so they needed a solution to the issue of blade weld failure.

Structural weak points in critical welds were leading to failure of a prototype impeller

Application

Prototype cooling water system for a nuclear power plant.

- 370 mm OD
- 220 mm height
- Projecting flow rates of large scale production impellers that were twelve times the size of the test part.

Existing solution

Machined in three stages the core was CNC turned, outer shape CNC turned and the rotors were flame cut from plate and welded into place. Different companies were doing these operations creating a complex and convoluted supply chain.

James Walker solution

James Walker provided a turnkey solution as a way of simplifying the supply chain. We sourced the material and used 5-axis machining technology to machine a single-piece finished product from solid bar using the customer's existing drawings.



Results and benefits

Switching from a welded assembly to machining from solid bar increased the tensile properties of the rotors and reduced the risk of failure associated with welding the rotor blades.

Coordinate Measuring Machine (CMM) measurements provided precise dimensional detail of rotor positioning which was a reduction in key documentation from three different sets of material certificates, dimensional inspection reports and LPI confirmation reports to one document package.

The change to a single machined component increased the strength of the impeller and allowed the customer to successfully test the application before the production piece was initiated.

Reduced the risk of costly failures



Provided a successful solution to complete testing



Simplified manufacturing process and better product integrity using single-stage machining



Reduction in timeframe associated with multi-stage supply process

To find out more speak Expert2Expert at

jameswalker.biz

