

FANS KEEP CONTROL ROD DRIVE MECHANISM COOL

Overview

After safety, cooling is one of the most important issues that modern nuclear power plants face. In addition to keeping the reactor cool – a topic that receives much attention – keeping the control rod drive mechanism (CRDM) cool is critical as well. A new concept – a first-of-its-kind design – was recently implemented at a major nuclear power plant located in the Midwest U.S.

During a scheduled outage in the fall of 2014, the power plant decided to replace the reactor vessel closure head (RVCH) to improve pressure boundary degradation, subcomponent degradation and CRDM ventilation system reliability. Through research and investigating fan company capabilities, the engineering firm of record turned to their Twin City Fan & Blower representative to supply the fans because it understood that TCF can make custom fans to satisfy the requirements for the planned CRDM ventilation system.

Challenges

The purpose of the fans is to cool the CRDM, which is the drive mechanism, including the motors, that raises and lowers the control rods into and out of the reactor core. In addition to CRDM ventilation system performance, which included fan flow and damper position, the fan specification stipulated an all stainless steel construction, a custom stainless steel motor, special weld cleaning, ultra-low vibration, and a sound specification of no more than 85 dBA at 3 feet.

Special testing requirements for fans and motors also included full-flow CRDM ventilation system tests prior to shipping the components to the power plant. Special engineering requirements included translating the engineering firm's requirements into an

Quick Facts

Industry

Nuclear Power

Application

Fans keep control rod drive mechanism cool

Twin City Fan Representative

Summerell Company
Salem, VA

Challenge

Design fans to meet CRDM ventilation system performance requirements including all stainless-steel construction, special weld cleaning, low vibration and low noise

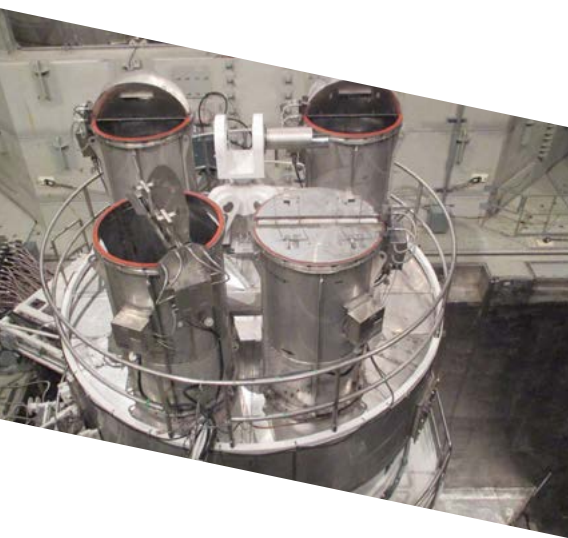
Solution

Customized, direct drive TSL tubular centrifugal fans with airfoil impellers



Model TSL
Tubular Inline
Centrifugal Fan

CASE STUDY



executable design. Although there were many changes in how much flow and pressure is necessary for this application, after the engineering firm locked in those performance specifications, it was critical that the fans supply that specific amount of air – no more, no less.

Solution

The CRDM ventilation system test that was done prior to shipment demonstrated acceptable ventilation system performance including fan flow, damper position and fan vibration. As a result of this successful test, Twin City Fan & Blower supplied six direct drive Model TSL tubular centrifugal fans with specially-designed, non-overloading 30-inch airfoil impellers. The design called for four fans for CRDM cooling; the remaining two fans are spares for the power plant.

The four Model TSL fans were mounted vertically in the CRDM, which is positioned at the top of the RVCH, part of the integrated head assembly. Each fan supplies 20,770 CFM at 5.7 inches WC of static pressure, driven by a custom 35 HP stainless steel motor turning at 1,760 RPM. In addition, the custom fans are constructed entirely of stainless steel, which were cleaned by hand using a nitric acid solution to remove any discoloration or marks from the welding process.

Results

The nuclear power plant can operate safely knowing that its CRDM ventilation system is functioning as designed. The fans met the specifications including the noise requirements. At 81 dBA at 3 feet, the fans were well within the limitations.

The Model TSL fans from TCF were selected because they satisfy the performance requirements. Twin City Fan & Blower worked with the engineering firm and the nuclear power plant to design a custom solution to meet the challenges of this unique application. No matter how unique the venture, TCF is uniquely qualified to provide efficient, reliable solutions.

Twin City Fan & Blower has the engineering and manufacturing capabilities to accommodate virtually every conceivable application. We have completed thousands of successful installations worldwide and have a proven track record for tackling the most technically complex and unique applications.

We separate ourselves from the competition by offering a greater breadth of products and quickly adapting to the needs of our customers. This is truly a testament to our company philosophy – respond to the needs of the customer, the first time, every time.



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