

# Canned Motor Vacuum Pump Replacement Solves Obsolescence Issue at CANDU Reactor

## CANDU owner turns to Hayward Tyler to provide drop-in replacement vacuum pumps

A CANDU reactor utilized Canned Motor Vacuum Pumps in their Moderator and Primary Heat Transport (PHT) Heavy Water Upgrader systems. These Canned Motor Pumps became obsolete. The original manufacturer of these pumps was no longer able to support the equipment when replacement pumps were needed. These liquid ring vacuum pumps circulate water from the Seal Water Tank which maintains the vacuum necessary for the system to operate. They are comprised of a canned motor with a specialized vacuum pump end. The new pumps had to be drop-in replacements while providing the same duty as the originals.

Hayward Tyler's engineering team reverse-engineered the liquid ring vacuum pump end and then integrated it with a customized HT canned motor. This ensured it provided the same conditions as the original.

Although the system was classified as Class 6, non-nuclear, the site required the pump to be designed in accordance with ASME Section III Subsection ND and CSA N285.0-12. Hayward Tyler supplied all the necessary calculations and documentation, approved by a local Authorized Nuclear Inspector (ANI) showing compliance to the codes.

Hayward Tyler utilized their quality program, which was required to meet CAN3-Z289.3- 1985: R2006 to control all aspects of the manufacturing and testing. This included following not only the quality requirements as outlined in the relevant standards, but also the acceptance criteria from IEEE 112, NEMA MG-1 and ASME PTC-10.

The pumps were tested in Hayward Tyler's facility in Vermont before successful commissioning the system on-site.

This project allowed site managers to solve a major obsolescence issue, contracting to Hayward Tyler for the complete execution of the contract, including the design, manufacturing, inspection and testing, while complying with various specifications and nuclear codes.

## Project Summary

### SITE / LOCATION:

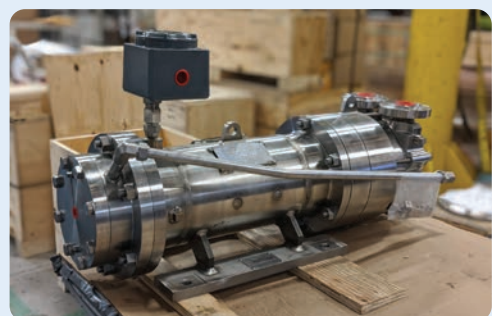
CANDU Nuclear Reactor

### SCOPE OF WORK:

- Supply of Canned Motor Vacuum Pumps
- Design drop-in replacement
- ASME Sec. III and CSA N285 code calculations
- Quality program following CAN3-Z289.3
- Performance test

### BASIC PUMP/MOTOR DESIGN DETAILS:

- Canned Motor with Liquid Ring Vacuum Pump
- Service: Moderator and Primary Heat Transport Vacuum Pumps
- Model: 1.5 x 1.5 x 4 CMVP / UM2-K3
- Rated Flow: 78 m<sup>3</sup>/hr
- Suction Pressure: -92 kPa(g)
- Design Pressure: 1035 kPa(g)
- Design Temp: 149°C
- Rated Power: 12 hp
- Speed: 3520 rpm
- Power Supply: 575 V / 60 Hz / 3 ph



## Project Data Sheet

<b>Product</b>	Canned Motor with Liquid Ring Vacuum Pump	
<b>Quantity</b>	Three (3)	
<b>Codes and Standards</b>		
<b>Design Standard</b>	ASME B&PV Sec. III, Div 1 Subsection ND Class 3, Stamped	
<b>Material Standard</b>	ASME B&PV Sec. II	
<b>Welding</b>	ASME B&PV Sec. IX	
<b>Pump &amp; Motor Tested</b>	Pneumatic Hydrostatic Helium Leak Performance Test Extended Run Test Vibration Winding & Motor Integrity Tests	
<b>Pump Details</b>		
<b>Type</b>	Top Suction and Discharge	
<b>Size</b>	1.5 x 1.5 x 4 CMVP / UM2-K3	
<b>Fluid Pumped</b>	Air + Water Vapor	
<b>Rated Flow</b>	343 US gpm	78 m <sup>3</sup> /hr
<b>Rated Pressure</b>	-13.3 psig	-92 kPa(g)
<b>Design Pressure</b>	0 psi	0 kPa(a)
<b>Design Temperature</b>	300° F	149° C
<b>Motor Details</b>		
<b>Motor Rating</b>	12 hp	8.95 kW
<b>Nominal Speed</b>	3520	
<b>Power Supply</b>	575 V / 3 ph / 60 Hz	
<b>Motor Full Load Current</b>	12.9 A	
<b>Weights (Approximate dry)</b>		
<b>Pump</b>	155 lbs	70 kg
<b>Motor and Seal</b>	345 lbs	156 kg
<b>Total</b>	500 lbs	227 kg

## Other Candu Canned Motor Replacement Applications from Hayward Tyler:

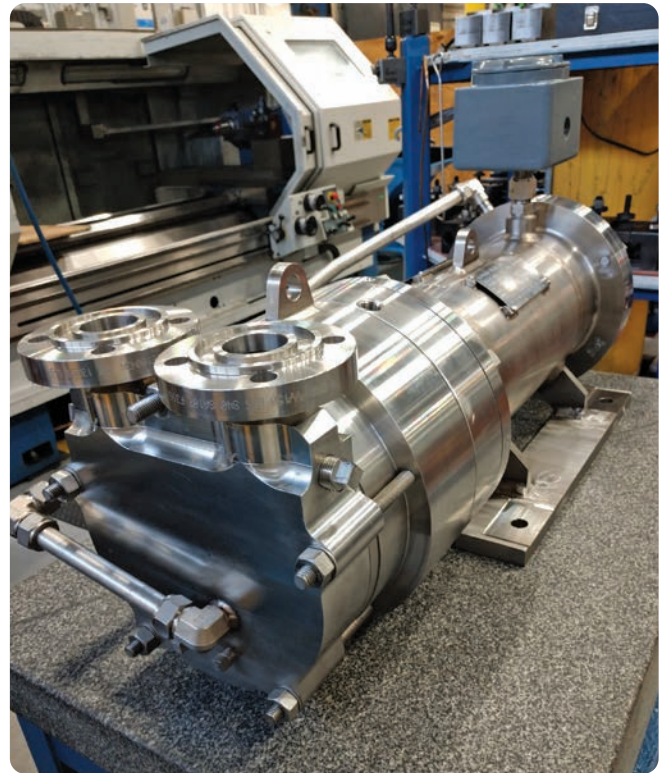
### Spent Resin De-deuteration Pumps

The Deuteration/De-deuteration system removes light water from the fresh ion-exchange resins prior to being used in the moderator and heat transfer water purification systems. The system then removes heavy water from the spent resins. The Spent Resin De-deuteration Pumps are used to pump heavy water within this system.

Hayward Tyler has supplied multiple Canned Motor Pump replacements for this application.

### Heavy Water Transfer and Collection

These pumps are installed in systems used to store and transfer moderator grade heavy water with the ability to transfer on demand for use in common services. Hayward Tyler has supplied multiple Canned Motor Pump replacements for these applications and other heavy water pumping services.



Engineered solutions for the global energy sector

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