

# Manitowoc Product Verification Center

Research and development  
for Grove, Manitowoc, National Crane, and Potain cranes





# No time for downtime

Our state-of-the-art Product Verification Center puts every Manitowoc crane and component on the line -- for quality, reliability and performance. We test and validate components throughout the entire design process to make sure Manitowoc and our cranes outperform your expectations. Our goal is to identify, reduce and even eliminate potential field issues long before a Manitowoc crane makes it onto your job site.

Our product verification initiative applies to not only the crane, but to all the components that go into it. We make sure our suppliers provide the best product every time, so that when it's time to build our cranes, we get it right the first time.

We are fully committed to quality control and passing on the benefits to our customers and their businesses -- saving time and money.



# A look inside the PVC



## ▲ Hydraulic system test bench

Simulates operating conditions and duty cycles to measure performance curves and component life of pumps, motors, cylinders, and valves. This information can then be used to define key performance characteristics for up-front system modeling, proves component durability meets targets, and reduces time to troubleshoot hydraulic system performance issues. This 150 hp test bench system is capable of 5,000 psi maximum operating pressure with flow rates up to 80 gpm and includes a 10,000 psi intensifier circuit for proof pressure testing.

## Engine testing

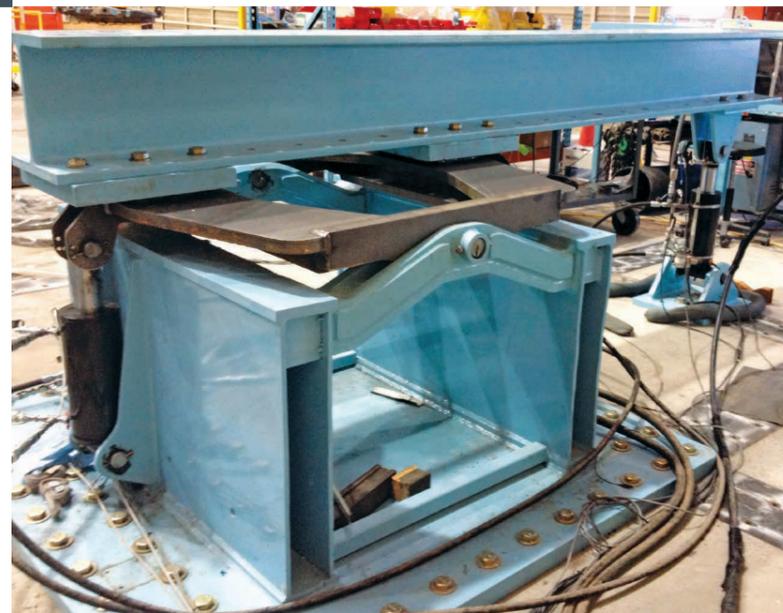
Engine and emission treatment systems are thoroughly tested using a 1,000 hp water brake dynamometer equipped with a closed loop load control and feedback system. Integrated data acquisition, along with advanced data processing and analysis tools, are used for approval of all Tier 4 engine applications. Onboard sensors and infrared cameras are used to study thermal properties of the engine and interactions with adjacent driveline subsystems.

## Materials lab

Verifies solid and liquid material samples for advanced analysis to determine if there is a potential for premature failure. (Ex: analysis of oil contaminants and dynamic viscosity.)

## Electro-dynamic vibration system

Mechanical random vibration and shock tests are completed on electrical components, providing simulations and screening to reduce production defects.



## Structural durability test system ➤

Performs accelerated testing and simulates stresses on major structural components to dramatically improve designs during early stages of product development.



## ▲ Highly accelerated life test chamber

Replicates and accelerates stress cycles based on temperature and vibration, allowing direct comparisons of supplier parts and sub-assemblies. The comparisons evaluate components based on both quality and cost data to ensure the best are selected.

## Electrical systems lab ▼

The Electrical Systems Lab merges the capability of electrical and software systems to evaluate crane subsystems and components. This includes verification of electrical components, software verification testing (on crane), measurement of electrical loads (on crane), field problem analysis and component supplier development.



## Cycle corrosion chamber ▼

Accelerated corrosion testing compares products directly or to globally accepted manufacturing standards. The controlled environment allows for repeatable testing and advanced environmental simulations.



## ▲ Vehicle performance

Simulation tests determine how the crane and components will work in real-life situations based on customer applications.

## Control room

Product test data is monitored and collected from this controlled environment to ensure expected results are achieved and provide a database for future product development projects.

## Vehicle Test Pads

The Vehicle Test Pads allow Manitowoc personnel to thoroughly test and analyze the performance of an entire crane before that crane becomes available to customers.



# Exceeding industry standards in Mean Time Between Failure

One of the main goals of the PVC is gauging crane and component performance. This includes testing Mean Time Between Failure, or the average expected time before the next component failure will occur. This test allows the PVC accurately measure product reliability and durability.

In an effort to verify the service life of the telescope cylinder in the RT770E boom assembly, the PVC performed long-term reliability testing on the prototype of the complete machine simulating the estimated usage of the crane over a 10-year period (26,315 boom cycles). The testing revealed a leak in the telescopic cylinder after 10,000 cycles, equivalent to about five years. In addition, it revealed failures in the boom shaft sheaves. With these findings, we were able to make design changes to the product in the development process, to ensure reliability of the entire crane. This enabled design and process changes, where applicable, so the unit could function more reliably.

The testing procedures performed in the PVC often open opportunities like this to further validate or prove out ancillary components within the entire system.



# Verifying supplier quality

During the process of developing a new product, the PVC tests selected components before they ever go into a crane. This ensures each component meets the defined PVC standards for performance. It also helps Manitowoc work with suppliers to correct and eliminate weaknesses in their products.

For example, the PVC conducted environmental testing on a component to be used on a new product. After the component was exposed to accelerated temperature levels and performed vibration tests, it was determined that the component did not meet Manitowoc standards. The PVC engineers studied the results and found flaws in the component software and in an integrated circuit. Manitowoc was then able to work with the vendor to verify their findings and redesign the part to meet the necessary specifications.

This example highlights how the PVC allows Manitowoc to ensure the highest level of consistent reliability in every product and grow a strong supplier network.

*“The PVC provides sophisticated component-level and full-vehicle testing to verify designs early in the product development process, allowing faster delivery of new designs, reduction in warranty and field problems, direct comparison of supplier components and development of competitive standards for verification.”*

**— Berrigan Remenick,**  
Director, Product Verification Center





## Building trust and reliability everywhere

Thanks to thorough testing procedures, the PVC allows Manitowoc to provide a consistent level of reliability and performance, regardless of where a component or product is manufactured. As an example, components for rough-terrain crane production at the Manitowoc factory in Passo Fundo, Brazil, were initially shipped from the Manitowoc factory in Shady Grove, Pa. To shorten production time and meet local government standards, Manitowoc needed to begin purchasing components from suppliers directly in Brazil.

Using standards set by the PVC and global Manitowoc engineering groups, the components sourced from Brazil were rigorously tested, compared and if needed, adjusted to meet the standards of the product already used in Shady Grove. Because of this, rough-terrain crane customers in Latin America can be assured they are receiving a product of the same quality. Manitowoc customers around the globe can expect a higher level of quality and durability because of the PVC — no matter where their jobsite is located or crane is manufactured.

## Analyzing load capabilities

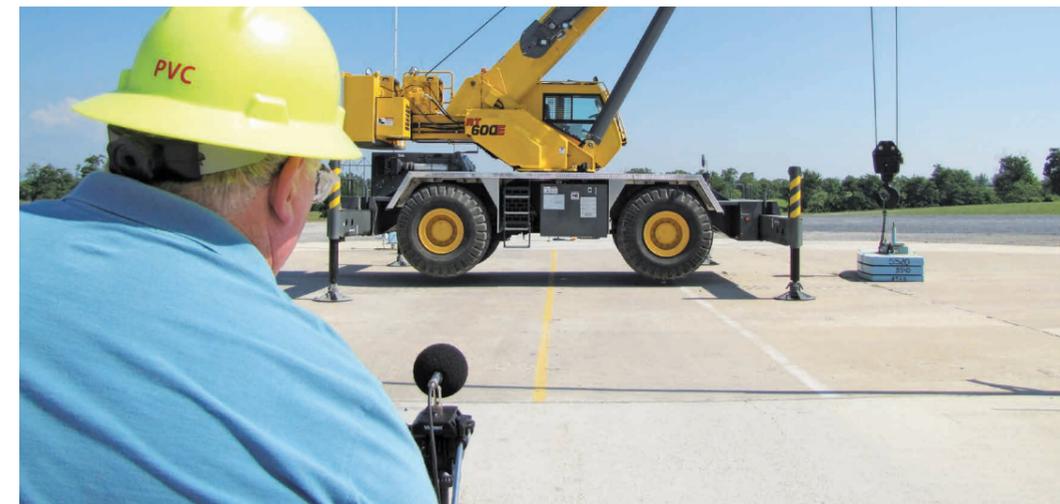
Before a new product is available to the market, the PVC conducts precise load and structural testing using strain gauges to process and capture structural load data. This allows the PVC to provide a thorough analysis for the load capabilities and strength of each crane. In turn, Manitowoc is able to communicate this information to customers and assist in determining the perfect crane for any job.

This testing was completed on the National Crane NBT60 boom truck during product development. As a result, the PVC was able to verify the maximum load capacity of the crane, as specified by the engineering team. With this, the final load chart was determined and production of the crane could begin.



# Manitowoc sets the standard for lifting innovation

Customers demand powerful, durable lifting solutions to grow their business — and Manitowoc delivers. From our superior family of cranes to our unbeatable customer support services through Manitowoc Crane Care, we are focused on ensuring your crane performs in peak condition throughout its entire life cycle. Your long-term success and profitability are our highest priorities, and we are committed to providing products that set the standard for lifting reliability and performance.





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