

Hanson Pipe & Precast HEIDELBERG CEMENT Group



Application Report >> Industrial Positioning Systems >> ARATEC® – The Positioning Solution System
>> Thermal Protection / Cooling Case >> TPCC® Thermo Protection Cooling Case

Hanson Pipe & Precast Relies on the World's Most Advanced Positioning System

PSI Technics Replaces Discontinued Trimble ICS5000L System

Project Scope: 3 Axes, FLP6000MC and ASC Software plus TPCC®

Hanson Pipe & Precast is one of the world's largest concrete pipe manufacturers, and the largest manufacturer of concrete products in North America. It is part of Lehigh Hanson, Inc., a member of the Heidelberg Cement Group and one of North America's largest suppliers of heavy building materials to the construction industry. In March 2011, the company's St. Martinville, Louisiana, facility decided to integrate PSI Technics' state-of-the-art ARATEC® Positioning Solution System into their fully automated crane system as part of the modernization of their existing facilities.

The previously installed positioning system, the ICS5000L with Advanced Skew Control (ASC) which was discontinued by the manufacturer Trimble, was replaced by PSI Technics' ARATEC® Positioning Solution System with Advanced Skew Control that provides single-axis control for the trolley traversing machinery. Due to the high environmental temperatures of more than 140°F (+60°C), Hanson Pipe & Precast decided to add PSI Technics' TPCC® Thermo Protection Cooling Case to protect their optical distance meters from the production plant's environmental conditions.

Long-time Hanson Pipe & Precast supplier – Hawk-eye Pedershaab – based in Mediapolis, IA, took a lead role in the project to ensure its success.

*On right:
Employees of Hanson Pipe & Precast welcome
PSI Technics on site.*



Hanson Pipe & Precast

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Project Description

The Challenge

Up to now, Hanson Pipe & Precast had used an optical based positioning system for bridge crane positioning. Like many other companies, Hanson Pipe & Precast was faced with the decision to completely renew their crane automation system or to modernize the existing installation, after the manufacturer had discontinued its factory automation production line in 2005. Due to its modular design, PSI Technics' ARATEC® Positioning Solution System was the only system that provided for a seamless integration into the company's existing facilities. ARATEC® delivers innovative features and a high availability to Hanson Pipe & Precast.

During the modernization process, PSI Technics faced several challenges. One of the biggest challenges consisted of the handling of varying loads, because the production process and the manufacturing and curing process of the concrete pipes played a vital role. The weight of the freshly poured concrete pipes that are stored for curing differs from the weight of the retrieved cured pipes. Therefore, precise positioning with millimeter accuracy as well as oscillation-free acceleration, deceleration and positioning while handling heavily varying loads were of utmost importance.



The Implementation

The crane's traveling axis was previously equipped with three Trimble ICS5000L control units and Trimble ASC.

The goal was to modernize the system while keeping costs for technical equipment to a minimum. To guarantee a fast and easy commissioning of the system the required technical data was collected during a preceding plant inspection, called a site audit.

During the inspection, PSI Technics noticed that the customer operated the existing ICS5000L positioning system in an environment where temperatures exceeded 140°F (+60°C). Consequently, PSI Technics' Thermo Protection Cooling Case (TPCC®) for the protection of temperature-sensitive sensors was the perfect addition to Hanson Pipe's installation and ensures maximum sensor life.

*On left:
Bridge Crane at Hanson Pipe & Precast*



Technical Description of the Facilities

Technical details
of the bridge crane are listed below:

Bridge Crane – Technical Data

- >> Span: approx. 98 ft (30 m)
- >> Height: approx. 16 ft (5m)
- >> Max. traveling speed: 5.18 ft/s (1578 mm/s)
- >> Max. acceleration: 0.76 ft/s² (232 mm/s²)
- >> Max. travel distance: approx. 196.8 ft (60 m)
- >> Max. load capacity: approx. 32 tons
- >> Dead weight: 50 tons
- >> Drives: 2
- >> Frequency inverters: 2

Trolley – Technical Data

- >> Max. traveling speed: 2.10 ft/s (640 mm/s)
- >> Max. acceleration: 0.80 ft/s² (245 mm/s²)
- >> Max. travel distance: approx. 82 ft (25 m)
- >> Max. load capacity: approx. 25 tons
- >> Drives: 1
- >> Frequency inverters: 1

Technical details
of the old positioning system:

Bridge Crane:

Communication protocol:

- >> RS232, ASCII protocol for ICS5000L,
9600 baud, 8 data bits, 1 stop bit, no parity

Frequency inverter control:

- >> Voltage: 0-10V
- >> Direction change through
forward/reverse contact

Trolley:

Communication protocol:

- >> RS232, ASCII protocol for ICS5000L,
19200 baud, 8 data bits, 1 stop bit, no parity

Frequency inverter control:

- >> Voltage: 0-10V
- >> Direction change through
forward/reverse contact



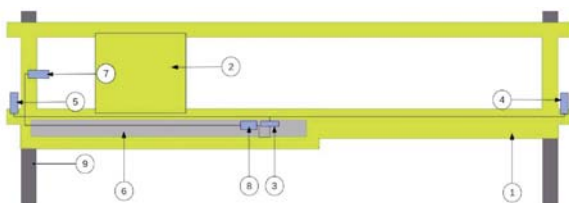
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The Solution: System Modernization Using ARATEC®



System Setup Prior to Modernization

The original system setup included two ICS5000L units that were connected to an advanced skew control. The skew control was connected to the PLC via a communications line and synchronized the movement of the crane bridge after a travel command was issued. A single ICS5000L directly communicated with the crane controls and controlled the trolley movements. The ICS5000L cables were used for serial communication and for the transmission of set points for the frequency converters, digital brake and safety signals as well as forward/reverse signals.

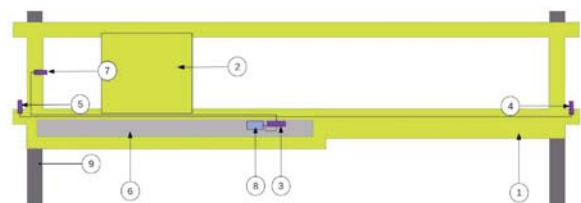


1. Crane
2. Trolley
3. Trimble ASC
4. Trimble ICS5000L (ASC)
5. Trimble ICS5000L (ASC)
6. Control Cabinet
7. Trimble ICS5000L, Single-Axis Control
8. Control
9. Crane Rails

*The hardware setup before the modernization –
Bridge Crane Diagram – Top View*

System Setup After Modernization

During the modernization, the cabling requirements were considerably reduced. Laser distance meters provide positioning feedback to the ARATEC® Positioning Solution System. A single system, which is expandable to support three axes, was able to replace three Trimble ICS units in one, consolidated hardware control unit. The control unit receives distance values from the laser distance meters via its SSI interface and merely requires a signal line to the laser distance meters. A single cable per laser distance meter is sufficient. The cable acts both as a power supply and transmits the SSI signals. After the modernization the communication signals and the analog signals are routed from the control cabinet to the corresponding modules of the control unit.



1. Crane
2. Trolley
3. ARATEC® Control Unit
4. Laser Distance Meter
5. Laser Distance Meter
6. Control Cabinet
7. Laser Distance Meter
8. Control
9. Crane Rails

*The hardware setup after the modernization –
Bridge Crane Diagram – Top View*

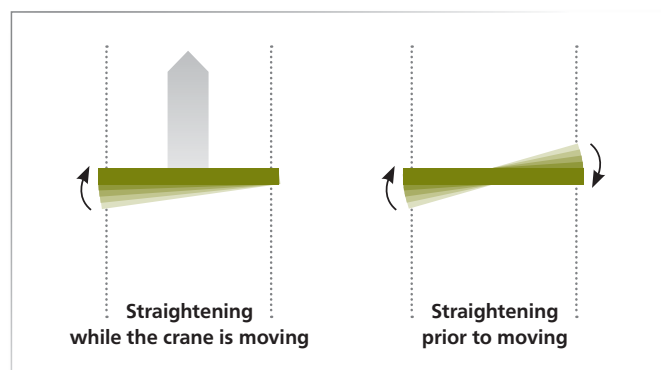


Laser distance meters 4 and 5 provide positioning feedback to PSI Technics' FLP6000ASC Advanced Skew Control software. Laser distance meter number 7 provides feedback for trolley positioning with the FLP6000MC software. Thus, the original positioning system and all features were completely replaced by the modular ARATEC® hardware configuration. The control unit provides centralized control for all bridge crane positioning tasks.

PSI Technics' FLP6000ASC software, however, uses two independent single-axis control systems. Each controls a single motor drive according to a master-master principle. The innovative and intelligent software recognizes and immediately compensates for any interference. If, for example, an axis decelerates due to increased resistance, the system immediately responds and accelerates the axis and the synchronized operation of both axes will be restored instantly. The Advanced Skew Control software not only ensures a synchronized movement of both axes, it also eliminates any manually introduced skewing by squaring the crane bridge before a movement is initiated.

Whenever skewing occurs, the bridge can either be squared prior to a movement or while the bridge crane is moving. For particular applications, deliberate skewing can be introduced. Example: A bridge crane lowers steel plates onto a production line that is positioned diagonally to the crane path. In this case, skewing can be introduced to ensure that the crane is moving parallel to the production line and lowers the plates at the correct angle. This can be defined in the vehicle's motion path profile.

The following figure illustrates the squaring of the bridge.



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TPCC® Integration

The high temperatures at the Hanson Pipe & Precast site constituted another challenge. The wet concrete pipes are steam-treated at the plant while curing. As a result, environmental temperatures in the production hall exceed 140°F (+60°C) – a significant disadvantage, since it not only shortens the life-span of laser sensors, but it can also lead to higher maintenance costs.

To eliminate the risk of malfunctioning sensors in the future, the sensors will be protected by PSI Technics Thermo Protection Cooling Case (TPCC®). This innovative cooling case is made of lightweight composite material that provides excellent insulation and cooling properties. Since the TPCC® was specifically designed for an easy integration into existing industrial facilities the mounting and electrical installation at the crane went smoothly.

Another big advantage for the customer was that the TPCC®'s 24 V cooling system is based on thermo-electric processes, so no additional modification of the system was required.

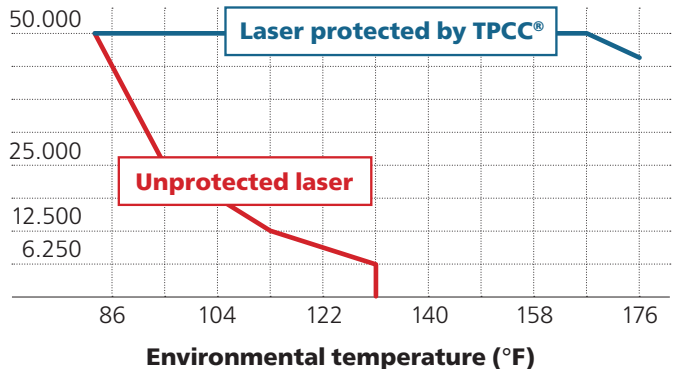
The graph shows how a laser distance meter's life-span decreases when it is used unprotected in environments where temperatures exceed 122°F (+50°C). The TPCC® provides optimum protection from high temperatures and temperature fluctuations for Hanson Pipe's laser sensors. A wide variety of optical sensors can be used with the TPCC® to further expand the sensors' application range.

On right:
TPCC® used on the bridge crane
after modernization



The TPCC® increases the life-span of your laser

Hours (h)



Life-Span of Laser Sensors – Comparison



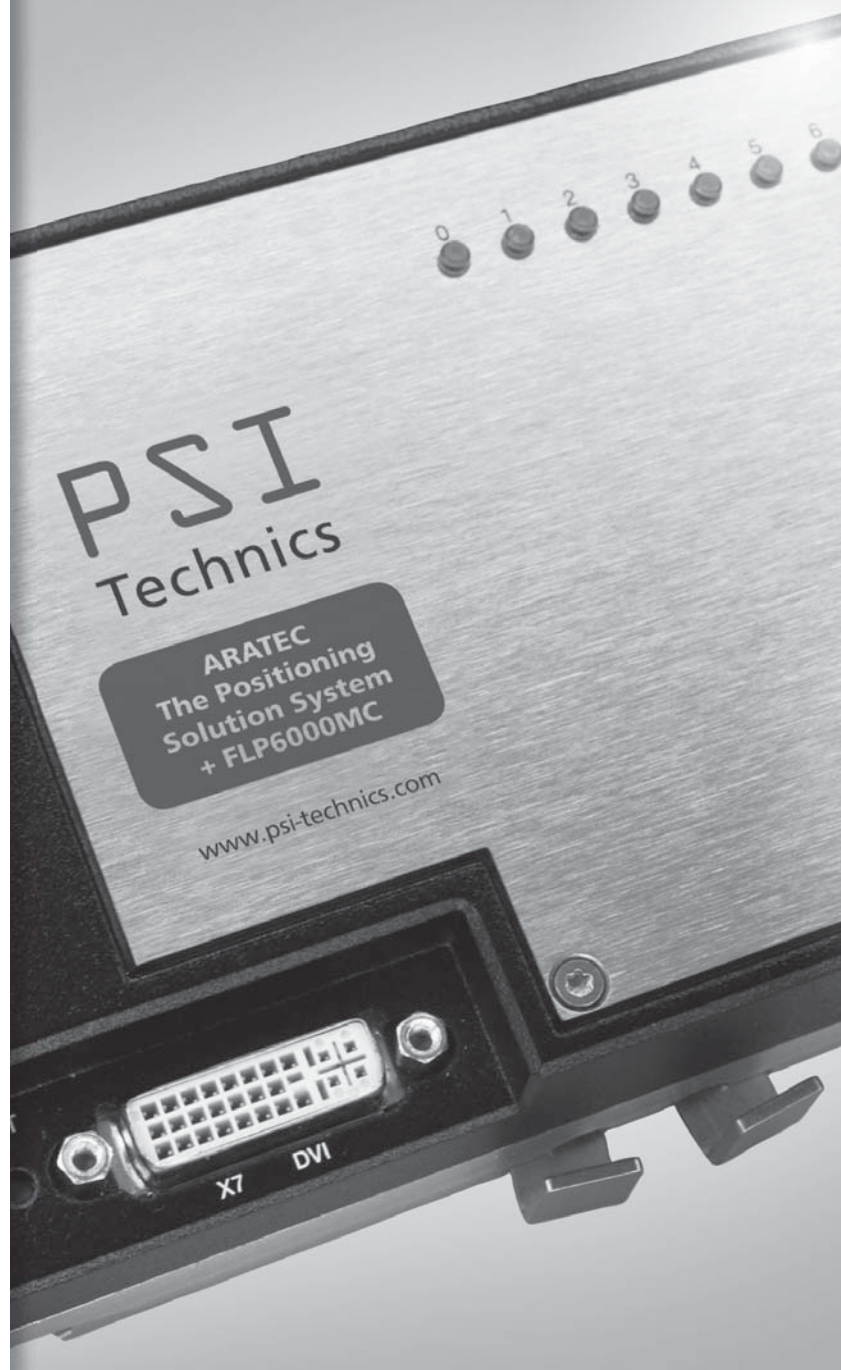
Customer Feedback

**Ben Schmidgall,
Chief Automation
Engineer for Hawkeye
Pedershaab,
who worked closely
with PSI Technics
throughout the
project.**



„The PSI Technics team members are all highly professional and their expertise in every phase of the implementation: pre-sale planning, pre-installation site audit, installation and commissioning and post-sale service allowed the conversion to occur seamlessly.

The PSI Technics solution offered many advanced improvements from the old system: Off-the-shelf lasers; cooling options to extend the life of the lasers; Ethernet-based communication for remote assistance; data logging, graphing, and backup features.“



Conclusion

PSI Technics' ARATEC® Positioning Solution System and the TPCC® provide Hanson Pipe & Precast with a durable and robust solution for their internal logistics processes.

The modernization of the system for three axes with FLP6000ASC software and the integration for the TPCC® were completed in under a week – including the preceding plant inspection. Thanks to its modular design ARATEC® delivers a fast, efficient and flexible solution.

More importantly, Hanson Pipe & Precast not only benefits from precise positioning, but also from reduced maintenance costs and an increased life-span of their facilities.

*Below:
Bridge crane after modernization*



Awards



ISB Success 2008

ISB Success 2008, awarded by
Investitions- und Strukturbank
Rheinland-Pfalz (ISB), Germany

PSI Technics offers intelligent and efficient solutions that improve productivity and quality in the following fields: Factory automation, industrial positioning systems, industrial image processing, thermal protection of sensors, EMC analyses, temperature/humidity monitoring and analysis, safety engineering as well as R&D for energy efficiency and energy management.

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