CUSTOMER PRESENTATION BRIEF
As presented at the 2017 Users Conference

OSIsoft.

SUMMARY

Caterpillar Inc.

Industry

Transportation

Business Value

- Business Intelligence
- Predictive Maintenance
- Operational Insight
- Performance Optimization
- Process Controls
- Risk Management

PI System™ Components

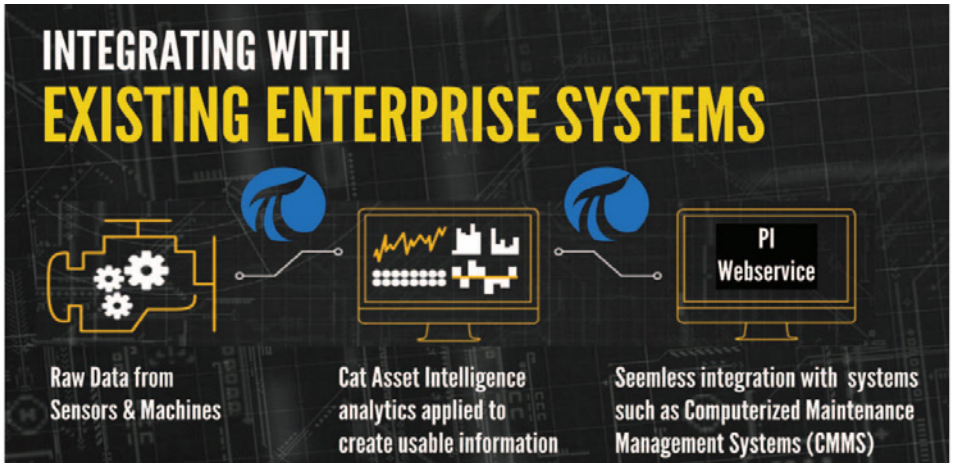
- PI Server™
- PI Connectors
- PI Vision™
- Developer Technologies

Ahoy! Caterpillar Uses PI System Data for More Efficient Marine Vessels

Caterpillar is a 90-year-old company that manufactures heavy-duty iron equipment that ranges from engines to diggers to bulldozers. With a slogan of "Built for It," Caterpillar prides itself on delivering high-quality products so its clients can see return on investment. However, in a digital age, return on investment is no longer limited to equipment functionality, especially for marine vessels. It's about using sensor data from those assets to improve vessel performance and maintenance strategies. With the help of the OSIsoft PI System, Caterpillar created Cat Connect to apply analytics to raw vessel data and turn it into actionable information.

Staying Afloat

Caterpillar manufactures medium and high-speed marine diesel engines, but keeping a vessel running goes far beyond the engine room. "A crane can go down, or an engine issue can cause a ship to go offline or not meet contractual obligations," said Rob Bradenham, Global Sales and Business Development Manager at Caterpillar, during the 2017 OSIsoft Users Conference in San Francisco. "So, how do we add value to not just the scope of the supply that we sold the customer, but everything else that is critical to that customer?"



With Cat Connect, Cat uses the PI System to help customers reduce operating and maintenance costs and optimize vessel performance and efficiency. Using onboard and onshore PI Servers and PI Connectors, as well as PI Vision[1] to visualize data, Cat gathers data from different onboard systems to provide an interface for onboard engineers and send data ashore for operations team members to analyze.

Crusin' with Data

Cruise ships are often powered by Cat's medium speed diesel engines. These engines have 5,000+ sensors that are connected to both an automation and PI System. On one ship, analysts and advisors noticed that the temperature of one cylinder was increasing at a greater rate than the others. After analysis, the team was able to identify the likely problem and cause, and the engine was fixed before it went down. With PI System data, the cruise line avoided a shut down that would have resulted in no power or air conditioning for passengers. The repair was also completed during scheduled maintenance so technicians didn't have to scramble to find parts or make last-minute travel plans. Thanks to preventative maintenance, the cruise line saved $10,000.

Tug of War

An inland river tug company uses no Cat products, but Cat analyzes tugboat data using the PI System to understand engine performance. The engine malfunction alarm was set to ring at the exact time of engine failure, which wouldn't help prevent issues, so Cat examined fuel pump supply pressure data to create a boundary line to determine when engine speed and pressure were operating outside of normal range. After noticing engine performance deviations, Cat gave warning at seven, four, and two days before engine failure, but the tug company did nothing. The failure ultimately cost an additional $35,000 in parts, service, and unplanned downtime.

RoRo Your Boat

RoRo's massive ships haul everything from automobiles to diggers. A clean hull is a big driver of fuel efficiency, and more growth requires more power and fuel to propel the vessel. "Fuel is the majority of the total lifetime cost of a vessel (70%). If you can take that down just a few points, it's a huge win," noted Bradenham. With varying water temps and sea currents, it's difficult to determine a precise cleaning schedule but, using PI System data, Cat was able to predict the most optimal time to clean the hull. By shifting away from scheduled to condition-base cleaning, the company will save about $450,000 in fuel per year, per vessel.

With the help of onboard sensors and PI System data, Cat is adding valuable services on top of producing leading iron products. For the cruise line, Cat Connect is projected to save $1.5 million per year, and will save the tug company $230,000 per vessel. For each RoRo boat, the estimated fuel savings per year is $400,000, and the value for these brands doesn't stop there. Now, Cat is feeding PI System data into computerized maintenance and ERP systems so those insights can drive value across the organization, and creating yet another opportunity for Cat to better serve its customers.

> "In the cruise ship world, because of the amount of fuel they're burning and the inefficiencies of air conditioning, looking at all the different levels, it was over $1.5 million per year of potential value."
>
> – Rob Bradenham
> Global Sales and Business Development Manager

[1]PI Coresight was renamed to PI Vision in 2017.

Bradenham, Rob. *Welcome to the Age of Smart Iron: How Technology Innovation is Driving Change in the Marine Industry*. OSIsoft.com. 22 Mar. 2017. Web. 30 June 2017. <http://www.osisoft.com/Presentations/Welcome-the-Age-of-Smart-Iron--How-Technology-Innovation-is-Driving-Change-in-the-Marine-Industry/>