



2021 Award Nomination

Title of Innovation:

Non-Intrusive Corrosion for Plantweb Insight



Nominee(s)

William Fazackerley, Emerson Automation Solutions



Category:

(select one below)

Coatings and Linings
Cathodic Protection
Materials Design
Chemical Treatment

Instrumentation
Testing
Modeling/Risk Assessment
Other - Corrosion Monitoring

Dates of Innovation Development:

December 2018 – December 2020

Web site: <https://www.emerson.com/en-us/catalog/emerson-sku-plantweb-insight-application>

Summary Description:

The new Non-Intrusive Corrosion application for Emerson’s Plantweb Insight gives customers superior understanding of the condition of their assets, allowing better predictive maintenance and optimization of the plant. Rosemount Wireless Permasense corrosion data is delivered securely to the end users’ desk through the Plantweb Insight platform, offering real time advanced analytics to assess the impact of profitability-driven process changes. Utilise the retirement planning feature to drive turnaround extensions and avoid unplanned downtime. Minimise maintenance costs through better replacement part planning as well as reduced manpower costs through remote and dangerous location monitoring. Discover detailed visualisations which enable large data sets to be analysed quickly and effectively. Seamlessly integrate with the entire Plantweb Ecosystem, allowing data export to process historians, as well as use of the network and power module management apps to facilitate easier diagnostics and

maintenance of equipment.

Full Description:

(Please provide complete answers to the questions below. Graphs, charts, and photos can be inserted to support the answers.)

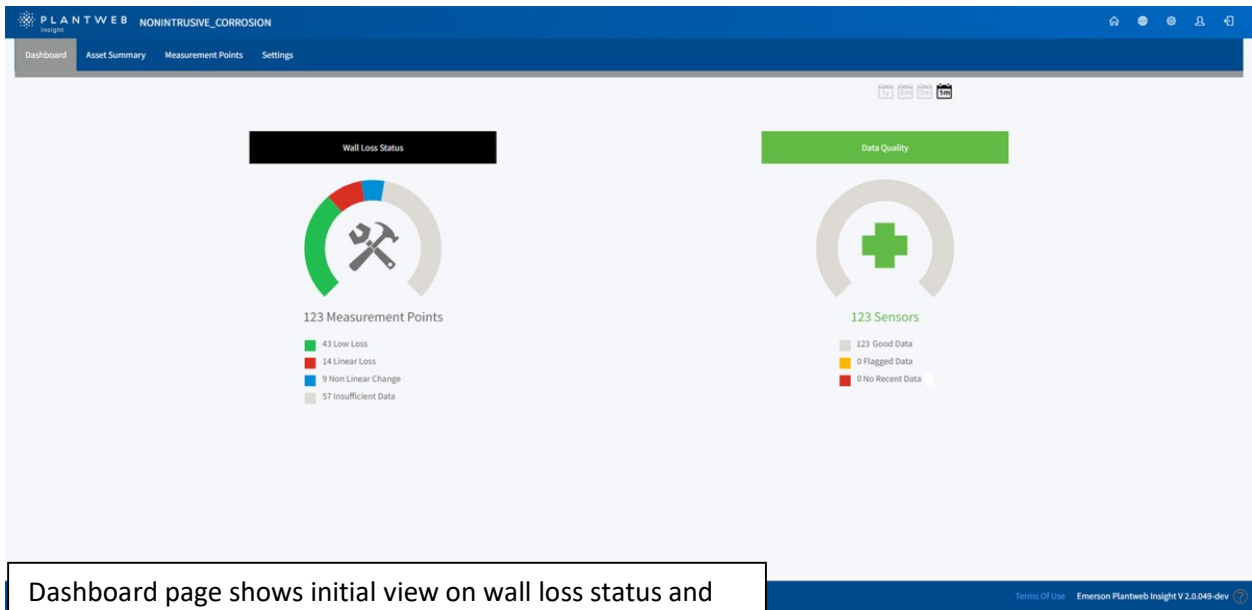
1. What is the innovation?

Plantweb Insight, an industrial analytics solution, offers instant visibility to key assets, enabling you to make better, faster decisions to digitally transform your operations. The Non-Intrusive Corrosion Application supports Rosemount Wireless Permasense transmitters, which use patented ultrasound technology to provide wall thickness data. This data must be interpreted, namely signal processing, into actionable information by software. Legacy software has been replaced by this highly intuitive and action-oriented platform, driven by the latest in software development standards.

2. How does the innovation work?

Ultrasonic wall thickness data is transferred using WirelessHART technology to a gateway in the hazardous area of the plant. The WirelessHART gateway communicates with the Plantweb Insight application, which is installed in an application server elsewhere on the plant. Technicians, engineers and managers can all view relevant corrosion data from their desk or workstation. The application provides

- Temperature and material compensated wall thickness data
- 12, 6, 3 and 1 month corrosion rate information
- Asset lifetime expectation
- Metal loss heatmap
- Custom corrosion time periods
- Advanced waveform(A-Scan) view.



Dashboard page shows initial view on wall loss status and data quality, allowing end users to quickly focus on areas of interest; high corrosion rate or problem transmitters.

PLANTWEB insight NONINTRUSIVE_CORROSION

Dashboard Asset Summary Measurement Points Settings

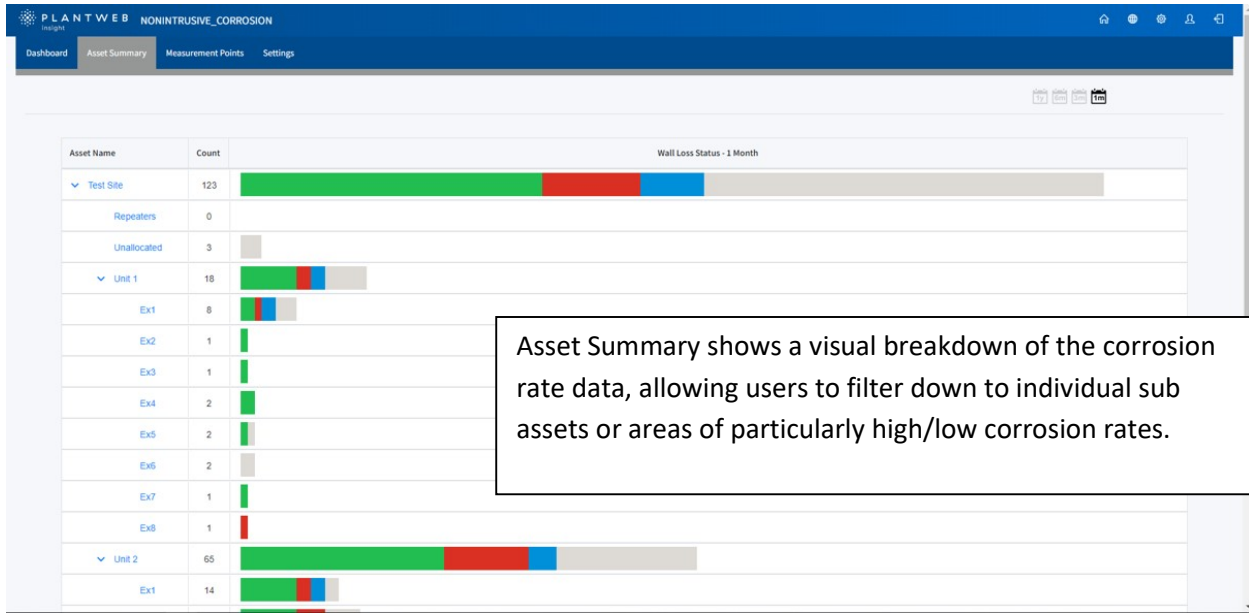
Test Site

Table Multiple Graphs Graph Waveform

Search text

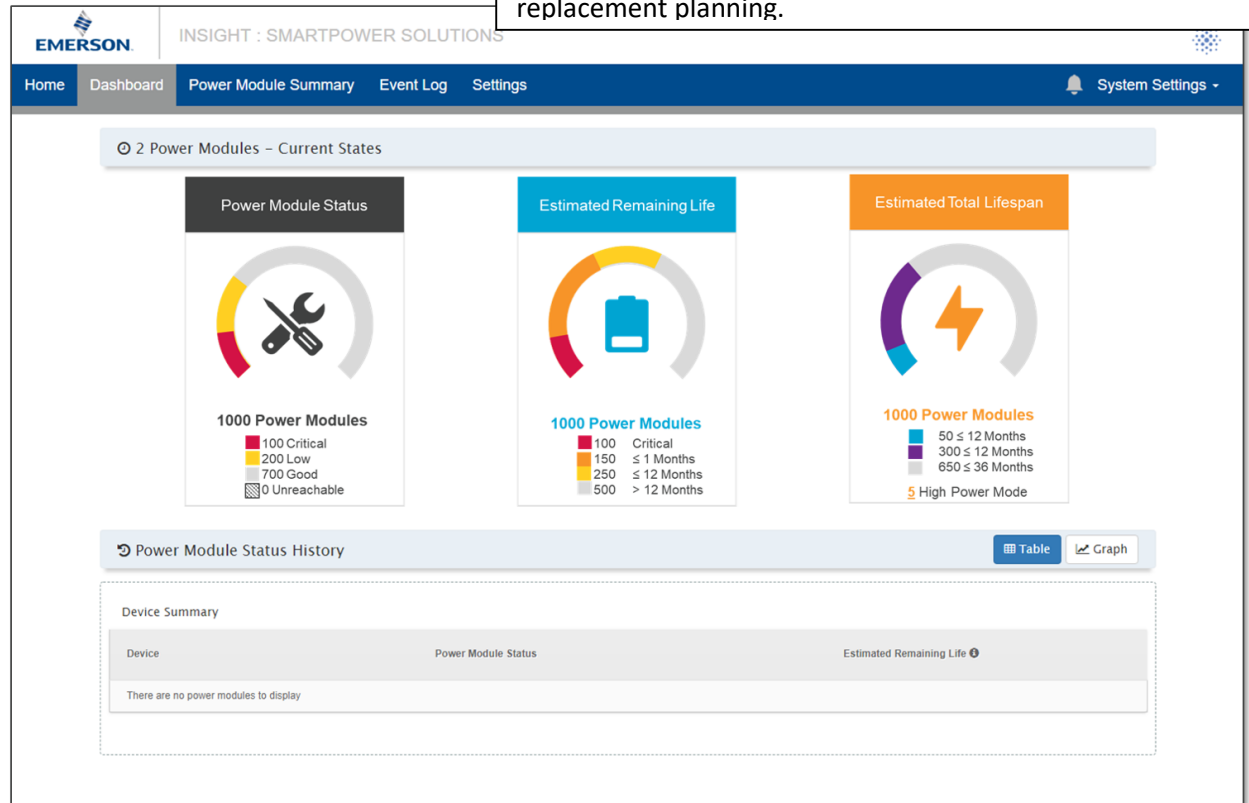
Asset	Name	Identifier	Sensor Id	Wall Loss Rate - 1 Month (mm/yr)	Wall Loss Status - 1 Month	Data Quality	Last Thickness (mm)	7 Day Average (mm)	Retirement Thickness (mm)	Remaining Thickness (mm)
Unit 1	P-1063 Elbow	P1063-522-E	G123	0.00 ± 0.13	●	●	29.85	29.86	23.00	6.86
Unit 2	P-4056 exit T	P4056-064-E	G682	0.12 ± 0.07	▲	●	14.42	14.42		
Unit 2	P-1064 TML 4	P1064-4E	G218	0.00 ± 0.02	●	●	7.26	7.26	3.60	3.66
Unit 1	P-1099 TML 13	S12-111-E	G1AB	0.00 ± 0.03	●	●	9.60	10.12	4.20	5.92
Unit 3	P-1217-A	P-1217-A-E	G8AD	0.00 ± 0.03	■	●	23.79	23.79		
Unit 2	P-1063-A	612-C-EG	G45F	0.01 ± 0.01	■	●	5.61	5.61		
Unit 1	Surface	E-202B	G20Y	0.01 ±	●	●	12.18	12.11		

Measurement points page lists all the measurement locations, filterable by sub address. Columns can be hidden or added, sorted and filtered, allowing end users to narrow down to the scope of interest.



Asset Summary shows a visual breakdown of the corrosion rate data, allowing users to filter down to individual sub assets or areas of particularly high/low corrosion rates.

The Power Module Management application shows power module health, including lifetime prediction, for reliable replacement planning.



Alongside this, end users can use the complementary network and power module management applications to check network and power module health status and plan maintenance activities.

3. Describe the corrosion problem or technological gap that sparked the development of the innovation. How does the innovation improve upon existing methods/technologies to address this corrosion problem or provide a new solution to bridge the technology gap?

The previous compatible software, Permasense Data Manager, was originally developed for the first generation of Permasense sensors in 2010 and was no longer appropriate to develop on. The Plantweb Insight platform is specially developed for analytical data, such as corrosion monitoring. The Non-Intrusive Corrosion application uses modern standards to incorporate patented wall thickness signal processing methodologies, for best in class performance.

Plantweb Insight uses microservice based architecture resulting in a highly maintainable and testable environment, ensuring better quality and scalability. On the front end, an Angular Javascript framework provides best-in-class visualisations and interactivity through a modern and highly functional front end.

4. Has the innovation been tested in the laboratory or in the field? If so, please describe any tests or field demonstrations and the results that support the capability and feasibility of the innovation.

The application is in final testing and will be available for general release in December 2020. Although the front end and visualisations are newly developed, the fundamental and patented signal processing engines are unchanged, ensuring high quality, reliable and repeatable data. This means that we have over 10 years of experience supporting the capability of the wall thickness measurements. Combined with this, the Plantweb Insight platform has been released for several years for many other applications, providing a broad range of end users key insights into the health of their assets. These two facts combined means that we are confident in both the capability and feasibility of the application.

Further, we have been running field testing since June 2020 at a production facility, and received good feedback from both IT security and corrosion management at the facility.

5. How can the innovation be incorporated into existing corrosion prevention and control activities and how does it benefit the industry/industries it serves (i.e., does it provide a cost and/or time savings; improve an inspection, testing, or data collection process; help to extend the service life of assets or corrosion-control systems, etc.)?

One of the key benefits of the application is the built-in ability to integrate with external host systems, such as process historians. This fact means that integrating the corrosion data with other relevant process information is easier than ever, and facilitates the easy analysis of the following use cases, for example:

Asset integrity or reliability managers are responsible for safety, both safety of the assets, and safety of personnel. Permasense systems reduce the occurrence of serious safety incidents

because corrosion events are detected long before any loss of containment. As an example, a medium sized refinery reducing the frequency of corrosion related incidents by just 5%, could save 200 thousand US dollar per year.

Maintenance managers are interested in making value add business decisions instead of performing manual rounds to gather data, as well as better planning their maintenance activities during turnaround such as pipework replacement. Permasense systems deliver real-time plant health data to desk and powerful visualisation and analytical tools allow asset lifetime prediction. A 3% reduction in both of these could add to 2.4 million dollars per year saving for a medium sized refinery.

Finally, operations staff such as corrosion or process engineers, or operations managers are looking at driving the plant to its maximum capability. Reduction of chemical additives, increasing the availability of the plant as well as reducing the turnaround or shutdown frequency all add up to a considerable cost saving.

A key driver in the refining industry is the ability to maximise so-called “opportunity crudes”, that is, mixing cheaper feedstock into your blends to maximise profitability. A 1% improvement could net 4.1 million dollar per year profitability enhancement.

With a total potential annual margin improvement of nearly 12 million dollars, the payback time for investing in a Permasense corrosion monitoring solution is weeks to months.

6. Is the innovation commercially available? If yes, how long has it been utilized? If not, what is the next step in making the innovation commercially available? What are the challenges, if any, that may affect further development or use of this innovation and how could they be overcome?

The application is in final testing and will be available in December 2020 when it will ship to the first commercial customer. There are no challenges that will affect further development; we have big plans to improve the visualisations and analytics on offer, as well as continuous improvement on the signal processing to encompass a wider range of sensing technologies through both hardware and software development.

7. Are there any patents related to this work? If yes, please provide the patent title, number, and inventor.

Ultrasonic detection of a change in a surface of a wall

Patent number EP2984447B1

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