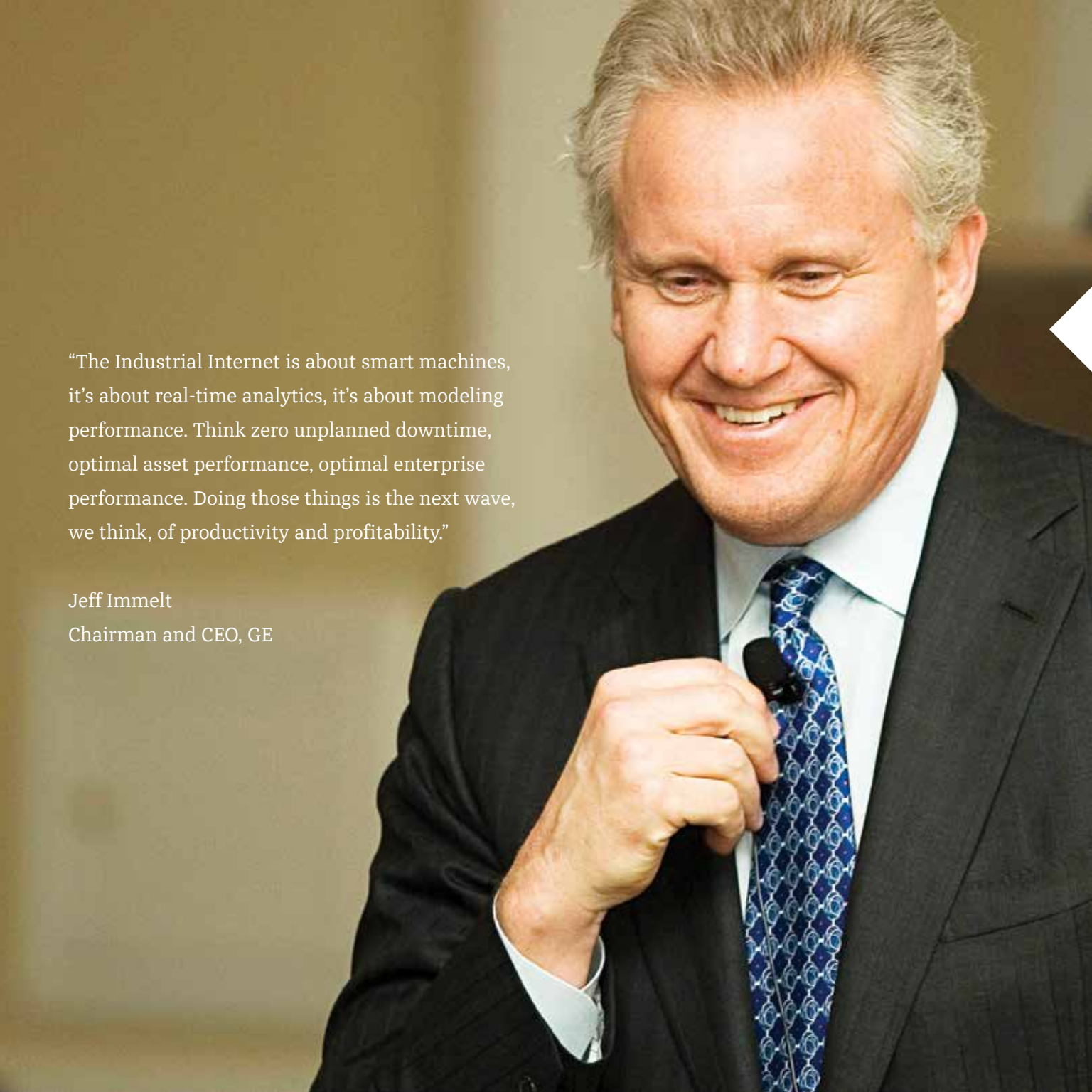# Proficy Monitoring & Analysis Suite

Software that makes the Industrial Internet real

> "The Industrial Internet is about smart machines, it's about real-time analytics, it's about modeling performance. Think zero unplanned downtime, optimal asset performance, optimal enterprise performance. Doing those things is the next wave, we think, of productivity and profitability."
>
> Jeff Immelt
> Chairman and CEO, GE

The Industrial Internet is here

The Industrial Internet is all about intelligent machines, advanced analytics, and people at work—coming together to solve problems as never before. It's about gathering much more data—"Industrial Big Data"—more efficiently and over longer periods of time—and using Advanced Analytics to interpret this data. It's about asking questions you've never been able to ask—and actually getting answers—so you can learn from the past to better understand the present—and predict and prevent problems in the future.

GE's Proficy Monitoring & Analysis Suite is at the forefront of the Industrial Internet. And it's not a theory. It's a fact.

GE is one of the largest and most successful global manufacturers. We understand industrial equipment and software to optimize performance. In fact, we use our own Industrial Internet software in our businesses—monitoring GE equipment—and in our Industrial Performance & Reliability Center (IPRC)—to monitor thousands of assets

for our customers. We constantly put our software to the test—to meet our own tough demands and the constantly changing needs of our customers.

This brochure will introduce you to GE's Industrial Internet software and solutions, the Proficy Monitoring & Analysis Suite—available now to optimize your operation.

Welcome to the Industrial Internet.

Proficy Monitoring & Analysis Suite

The Proficy® Monitoring & Analysis Suite (PMAS) is GE's set of software products and services for the Industrial Internet. PMAS collects, organizes, and analyzes equipment and process data and uses it to maximize productive output and lower operating costs, with fast payback and low risk.

Because it is fully integrated, PMAS reduces implementation costs and time-to-benefit. Because it's been proven through years of use in GE monitoring centers, it reduces your risk. And because we offer full implementation, monitoring, and maintenance services from GE equipment and software experts, PMAS can be used by any company, regardless of level of IT and engineering expertise.

This end-to-end solution includes both Industrial Data Management (IDM) software—to collect, organize, store, visualize, and analyze your data—and Advanced Analytics software—to improve both asset health and process performance.

PMAS software and services are inherently scalable, from a single plant to a multi-site global enterprise, and they support both local and remote/cloud deployments. PMAS brings enterprise-scale security and reliability to any size organization.

The first fully integrated and complete software suite that addresses exponentially growing industrial data sets, includes asset health and process optimization, and supports the transition from reactive to proactive and ultimately optimized operations.

"I often get asked, 'What does the Industrial Internet actually mean?' GE uses the term Industrial Internet to talk about three things working in sync. The first is brilliant machines, the second is advanced analytics, and the third is people at work…Brilliant machines are machines that can adapt to the environment they run in. Advanced analytics allow us to understand how things are running and how they could run if they used that information to improve performance. And people at work is connecting individuals at work or on the move, at any time, to support more intelligent design, operations, maintenance, and safety."

Bernie Anger
General Manager, GE's Intelligent Platforms business

INDUSTRIAL

BIG DATA

IS HERE

THE NEXT

REVOLUTION

BEGINS

Industrial Data Management

GE's Industrial Data Management (IDM) software is purpose-built for your industrial-data needs. Compared to traditional relational databases, it offers a much lower Total Cost of Ownership (TCO). And it's the only data-management software that integrates seamlessly with GE's Advanced Analytics software, providing you easy access to GE's advanced asset-health and process-improvement capabilities.

Central to our IDM software is an enterprise industrial data historian—Proficy Historian—that collects, stores, aggregates, analyzes, and visualizes key process data in context.
The software provides a distributed architecture, central management and administration, low storage costs, and a wide range of industry-standard interfaces.

The first cloud-enabled software solution for time-series data built on an industrial historian and Hadoop.

Historian is seamless and provides extreme scalability—from embedded technology in the control and SCADA layers, to site and enterprise scale with Distributed Historian Services, to a cloud-based Industrial Big Data solution based on Hadoop technologies. The software improves performance by han-

dling data sampling down to the micro-second and storing full-fidelity data 85% more efficiently than standard relational databases. And its built-in compression algorithms reduce the cost of storage.

Historian ensures availability of data by providing collector redundancy, active redundancy, and caching capabilities. It allows you to look at your data in context in multiple ways, depending upon how you want to analyze it.

Historian also has industry leading data-management capabilities, leveraging data stores to allow you to compartmentalize your data to set governance, retention, security, and quality policies with fine-grain control. Historian also supports user-defined collector expressions, which enable data cleansing, conversion, and computation at the point of collection. The same expressions can be used during visualization and analysis without requiring tag consumption, greatly reducing costs while maximizing capability.

Proven through tens of thousands of installs around the world, storing hundreds of millions of tags of information, Historian provides the backbone of PMAS.

Advanced Analytics

PMAS offers two types of Advanced Analytics capabilities—Asset Analytics to improve asset health, and Process Analytics to improve and optimize processes. All Advanced Analytics software is fully integrated with our Industrial Data Management software, providing full advanced-analysis capabilities to your data.

Our Asset Analytics software— Proficy SmartSignal®—improves asset health by providing the earliest detection of emerging equipment failure, often weeks to months ahead of other technologies. This patent-protected software helps you detect and fix emerging issues before they become large problems—on your schedule, when most convenient and efficient. SmartSignal helps you avoid catastrophic equipment failure, process upsets, and unplanned outages—and even helps you to approach zero unplanned downtime.

With SmartSignal, you can maximize revenue by improving reliability and availability. You can reduce maintenance costs by replacing reactive maintenance with less expensive proactive maintenance. You can reduce maintenance frequency and duration by fixing only the equipment that needs to be fixed. You can reduce replacement costs by ordering parts when you are notified of an impending problem, not later during an emergency. You can extend asset life by fixing problems before they get serious. And you even can reduce energy costs by running your equipment more efficiently.

SmartSignal works on any equipment from any OEM in any service—any piece of equipment that's critical to production. The software detects the broadest range of equipment problems across the widest variety of assets, load ranges, and failure modes. We're currently using it to protect over 15,000 assets in the Power Generation, Oil & Gas, Mining, Aviation, and other industries.

Our Process Analytics software— Proficy CSense—provides deeper insight on your process performance. The software improves and optimizes your processes by providing powerful analytical tools that use leading-edge techniques to extract knowledge from existing historical process and manufacturing plant data. CSense helps to identify causes (unknown correlations) for production problems, along with opportunities for preventing these problems in the future. This software can be used for batch and discrete processes, as well as continuous processes. CSense helps you to increase yield, while reducing variability.
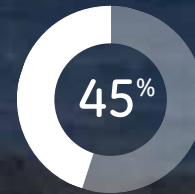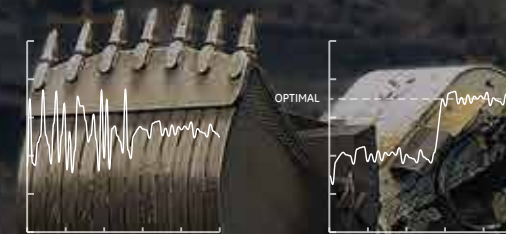
Actual customer results
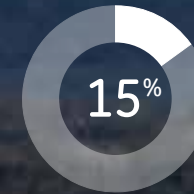
15% Improvement in availability of a haul truck fleet
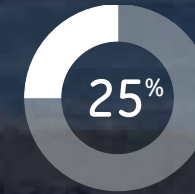
25% Decrease in variation in feed in a slag mill

45% Decrease in variation in cyclone feed pressure

Stabilization of pH control in the absorber in a gas cleaning plant

OPTIMAL

Optimization of performance of base-layer (PID) control

"Operators have to trust the analytics more than their own brains."

Automation World, Oct, 2013.

Industrial Performance & Reliability Center

Located outside of Chicago, Illinois, U.S.A. , GE's Industrial Performance & Reliability Center (IPRC) provides full monitoring services to customers who have constrained resources but need to avoid catastrophic equipment failure, process upsets, unplanned outages, and unplanned downtime.

The IPRC uses PMAS software along with deep subject-matter expertise to provide Predictive Diagnostic Advisories on emerging equipment and process problems. The IPRC currently monitors equipment globally for customers in the Power Generation, Oil & Gas, Mining, and Aviation industries—more than 5500 assets.

"Most engineers are extremely busy; they just need help, and they just need answers. The IPRC helps them get those answers with mature and simple predictive analytics and GE engineers they can trust."

Chad Stoecker,
IPRC Manager,
GE's Intelligent Platforms business

The IPRC's Customer Collaboration Portal supports interaction with the IPRC staff, organizing Predictive Advisory Cases in one place, and provides a fleet-wide view of assets. The Center provides multi-language support, including reports and phone calls in 170+ languages. And it provides follow-the-sun services—global overlapping monitoring centers for better communication and real-time service.

The IPRC makes the PMAS software easy to consume. All you have to do is give us your data. You don't need to invest in servers, IT, Reliability Engineers, or Reliability Managers. We handle it all—including all the application engineering, hosting of the system, maintaining the software, monitoring, and notifying you of emerging problems.

Foresight + Insight + Action: An integrated solution

The real power and uniqueness of PMAS is its ability to provide the **foresight** of asset failures months before they become major issues with the **insight** tools needed to diagnose the root cause of failures, allowing you to perform timely and cost-effective maintenance **action**. PMAS seamlessly integrates the cases generated by the IPRC with your onsite data in our Proficy Knowledge Center solution (PKC). PKC provides asset-centric views for your entire fleet of assets. It connects the predictive-analytic cases with onsite tools that allow you to build **standard diagnostic procedures** in order to institutionalize the processes around diagnostics for industrial equipment failures. This standardization reduces time-to-diagnose, ensures consistency in execution, and provides you a mechanism to institutionalize your diagnostic knowledge into a stepwise procedure that even novices can support.

Proficy Historian

This powerful software collects, archives, and distributes data securely at extremely high speed. It quickly provides the granularity of data you need to analyze and solve intense process-application problems. Built specifically for process-data acquisition and presentation, Proficy Historian delivers meaningful context to vast amounts of raw data from across your operations at any scale.

Proficy Historian HD

In addition to the above Proficy Historian functionalities, this advanced "Industrial Big Data" Historian enables businesses to more rapidly analyze and optimize assets and processes while utilizing next-generation Big Data technologies. It allows for data exploration and mining of massively large data sets not previously possible. And it allows customers to keep this data at much lower costs than in the past.

Proficy Historian Analysis

This is a web-browser-based analysis tool that focuses on the data captured within the Proficy Historian. It allows process engineers, managers, or anyone in the organization to quickly and easily view Proficy Historian data, visualize trends, and perform calculations and analysis to determine the root causes of process problems to drive fast resolution and continuous improvements.

Proficy Knowledge Center

Proficy Knowledge Center provides a consolidated fleet-level view of key equipment and process information for everyone throughout the enterprise. It expands on Proficy Historian Analysis with fleet and asset summaries, a consolidated alarm and event list, and seamless integration with the IPRC's Customer Collaboration Portal.

With the Customer Collaboration Portal integration, you can easily receive Predictive Diagnostic Advisories with initial analysis from the IPRC experts and seamlessly perform additional analysis and exploration of data within your Historian, which may not be available to the IPRC. This analysis is captured and stored for future use, building a "knowledge base" to support sharing of learnings and future analysis.

This software displays actionable information in a timely and collaborative fashion, leading to higher productivity and faster decisions.

Proficy SmartSignal

This software uses predictive analytics and diagnostics to analyze real-time data from industrial equipment and provide early warnings of failures or deterioration—along with diagnoses and prioritizations. It helps you identify what is going to fail, what is the apparent cause of the failure, and what is the priority of the impending failure. The software helps avoid catastrophic equipment failure while reducing unplanned downtime, increasing equipment availability, and reducing maintenance costs.

Proficy CSense

The Proficy CSense software integrates process monitoring, troubleshooting, and optimization. The software monitors both assets and industrial processes to pinpoint causes of process variation and to optimize performance—improving yield and quality.

Special features allow you to apply Advanced Analytics to your critical equipment—globally, securely, and efficiently—in the cloud. Always backed by GE.

Predictive Analytics

PMAS goes beyond trip and alarm protection. The solution delivers advanced notice of deviations in normal equipment operation. This gives you time to formulate the best plan of action, turning expensive unplanned downtime into efficient planned downtime, with shorter duration and lower costs.

Vendor Agnostic

Many vendors are offering monitoring solutions for their equipment. But using multiple point solutions across your organization can make it hard to make sense of your data. It can be difficult to collect, aggregate, and make available the data in context to the rest of the operation in order to answer difficult questions. PMAS is vendor-agnostic and can be your single solution for monitoring your plant assets and enterprise operations.

Remote

PMAS has integrated data-management capabilities to connect and manage assets either at a single site or around the world. This allows you to consolidate and leverage your expertise—and optimize all assets from one remote location.

Secure

Security is a requirement when it comes to your data and networks. PMAS addresses security with several layers. The software also transports your data securely over the Internet to either your hosted or cloud instance using technology that is FIPS 140-2 compliant.

Scalable

The PMAS software is seamless and provides extreme scalability—from embedded technology in the control and SCADA layers to an Industrial Big Data solution and Distributed Historian Services (DHS).

PMAS is cloud-enabled, which enables it to store and analyze much more data than is possible with commonly used software tools—across time and across your enterprise. Comparing years of historical data to real-time data allows for a myriad of analysis possibilities, allowing you to detect trends and patterns never before possible to better understand how equipment and processes *are* running vs. how they *should be* running.

Reduced IT Costs

Traditional methods of storing high volumes of industrial data can get expensive. Servers, hard drives, sans, DBAs, backup and restore procedures, and disaster recovery all drive up costs. PMAS offers advanced data-historian technology, allowing for a significant reduction in storage costs. Additionally, Proficy Historian HD shifts data from operational instances to a cloud-based infrastructure, further driving down costs.

Backed By GE

GE uses PMAS to monitor our own and our customers' assets every day. This allows us to constantly test the software and make improvements to increase capabilities, improve performance, and stay on the leading edge. We offer managed services using the Suite to all our customers through our IPRC. And, we provide flexible advisory services to meet our customers' needs.

Imagination at work

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