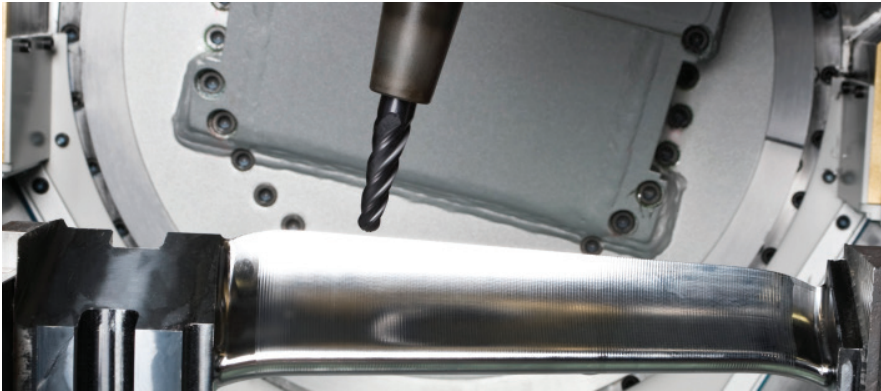# Drive & Control
profile

For System Insights, open connectivity and collaboration with Rexroth helped create a solution for a manufacturing facility.

The integration of System Insights VIMANA with the IndraMotion MTX controller improved machine utilization by ~15 percent in a single cell, saving $500,000 in the first year.

Controller Connected to Analytical Software through MTConnect Adapter

Software developer System Insights was tapped by a large power generation equipment company to install its VIMANA software platform in the company's facility for real time and historical analysis of manufacturing productivity. The solution included monitoring Liechti TurboMill milling machines controlled by Rexroth's IndraMotion MTX CNC controller. All of the machine tools in the facility were connected to VIMANA using the MTConnect standard. The VIMANA Connect MTConnect Adapter was developed to read the CNC and PLC information and provide data in the format of the open MTConnect standard to communicate with the IndraMotion MTX controller. With VIMANA, a centralized platform for analysis across all of its manufacturing equipment, the production and maintenance engineers at the facility would have the ability to consistently track productivity, as well as gain deep insights into the reasons for production disruptions, maintenance events and quality spills.

Challenge:

To improve utilization, productivity and cost efficiency of Liechti milling machines on the shop floor with the CNC controller IndraMotion MTX

Solution:

Collaboration and integration with System Insights' VIMANA predictive analytics software platform and open connectivity

Results:

Demonstrable improvement in machine utilization due to operational decisions that are now based on daily real-time productivity data

• Improved machine utilization by ~15 percent in a single cell, saving $500,000 in the first year

• Problem solving reaction time and skills have been improved

• Ability to proactively determine maintenance and productivity issues

DEVICE-11			DEVICE-15			DEVICE-16			DEVICE-18		
Producing			Producing			Unplanned Downtime: Machine Repair			Producing		
55% Utilization	3h 54m Producing	113 Process Count	62% Utilization	4h 23m Producing	98 Process Count	12% Utilization	52m Producing	5 Process Count	44% Utilization	3h 8m Producing	62 Process Count
1000 Spindle Speed	70 Tool ID	100 Path Feedrate Ovr	-1050 Spindle Speed	338 Tool ID	100 Path Feedrate Ovr	0 Spindle Speed	0 Tool ID	100 Path Feedrate Ovr	-4997 Spindle Speed	1 Tool ID	100 Path Feedrate Ovr
Operator - A			Operator - A			Operator - B			Operator - B		
KJ5BJDZFG08J			NI295D9HRN9			—			F099489OJ33		

DEVICE-22			DEVICE-25			DEVICE-27			DEVICE-33		
Producing			Producing			Planned Downtime: Setup			Producing		
80% Utilization	6h 15m Producing	43 Process Count	42% Utilization	3h 50m Producing	100 Process Count	32% Utilization	2h 14m Producing	53 Process Count	25% Utilization	2h 20m Producing	6 Process Count
8000 Spindle Speed	11 Tool ID	20 Path Feedrate Ovr	600 Spindle Speed	98 Tool ID	120 Path Feedrate Ovr	0 Spindle Speed	0 Tool ID	100 Path Feedrate Ovr	598 Spindle Speed	2 Tool ID	50 Path Feedrate Ovr
Operator - B			Operator - C			Operator - D			Operator - E		
I2B508B03B3			H482IU4IO2I32			BJ4IT6UBK2K3			H2O84IO32XK9F		

Manage machine operation by real-time monitoring of KPIs and machine process parameters.

Empowering Power Plants

The manufacturing company makes steam turbines for power plants that generate electricity all over the country. Among the most essential parts of the turbine are the turbine blades/foils. The company mills these turbine blades with the Liechti TurboMill machine. The operation includes over 70 of these machines, along with many others, all connected to the VIMANA dashboard so engineers can view real-time data on the performance of each machine.

IndraMotion MTX: Open, Flexible

With a modular design of hardware and software, the Rexroth IndraMotion MTX is perfectly suited for integration into a wide range of machine designs. Its many benefits include outstanding performance, simple operation and programming, scalable performance and functionality, a full-featured engineering framework and open system architecture. The CNC controller IndraMotion MTX delivers the highest productivity and efficiency for cutting, which is why it was chosen to control the Liechti milling machines.

Harmonizing the Data

For the integration of System Insights VIMANA with the IndraMotion MTX controller, the key factor was open connectivity, specifically OPC DA. According to Rexroth Machine Tools Market Sales Manager, Karl Rapp, "Since OPC is an interface that doesn't require DLL implementations, Rexroth didn't have to give System Insights a specific code or have it integrate a code. OPC is a nice open interface. In the end, integration with a partner like System Insights with OPC as a platform was fairly easy." Rapp adds, "Using MTConnect provided the added benefit of standardizing what the data naming is, what the data format is, and what the data means. Basically, the assigning of information bits and integers and real values from controllers into MTConnect allows that translation." OPC and MTConnect interoperability was used to harmonize the data, so the data coming from each machine would be the same. "Otherwise", states Rapp, "if the data is all different and has different formatting and attributes, it's very difficult for a software analysis tool to make sense of it."

Group	Summary	Trend	Apr	May	Jun	Jul	Aug	Sep
DEVICE-11	52.3 %		40.2 %	41.3 %	35.3 %	44.6 %	49.4 %	62.3 %
DEVICE-15	20.1 %		12.3 %	10.6 %	16.4 %	19.3 %	25.4 %	27.3 %
DEVICE-16	43.4 %		33.2 %	32.8 %	30.4 %	38.4 %	44.3 %	51.2 %
DEVICE-18	22.8 %		26.5 %	28.4 %	32.5 %	35.8 %	39.2 %	41.1 %
DEVICE-22	48.2 %		42.2 %	45.6 %	49.8 %	48.7 %	35.3 %	52.1 %
DEVICE-25	20.8 %		10.3 %	11.4 %	16.8 %	22.1 %	26.3 %	29.8 %
DEVICE-27	45.6 %		39.3 %	32.2 %	37.3 %	39.2 %	44.4 %	48.3 %
DEVICE-33	21.2 %		11.2 %	16.7 %	18.3 %	21.5 %	25.3 %	29.7 %
Summary	43.5 %		34.8 %	37.6 %	39.5 %	42.3 %	47.4 %	50.8 %

Measure and track productivity improvement using historical analysis of KPIs and metrics.

Collaboration Empowered by Standards

The project marked the first formal business collaboration between System Insights and Bosch Rexroth. "One of the things we really appreciate about Bosch Rexroth is that they reflect the way the whole Industry 4.0. space is evolving," says Dr. Athulan Vijayaraghavan, founder and chief technology officer for System Insights. "That is why Bosch Rexroth is so eager to collaborate with companies like us in providing value to its end customers. VIMANA is providing this customer a platform for manufacturing intelligence, integrating with Bosch Rexroth drive and control technology to connect assets and analyze, monitor, and optimize the factory floor for improved operational performance." The integration with Bosch Rexroth automation technology and the VIMANA Suite enables this customer to leverage their machine data for insight into machine utilization, maintenance, operator resource optimization and quality. Rexroth's Karl Rapp agrees. "Open interfaces give System Insights an edge. They can provide solutions to many users, small or large, connecting all of the equipment on the same network."

"Through it all, Bosch Rexroth partnered with us to make sure that we were able to connect with and analyze its equipment," says Dr. Vijayaraghavan. "This factory had various levels of modernization, and open standards are crucial to achieving 100 percent connected manufacturing. VIMANA Connect provides expanded connectivity to multivendor and legacy factory devices with interoperability of OPC UA and OPC DA to MTConnect. This data is then streamed to the VIMANA servers for advanced analytics generating dashboards for real-time monitoring and proactive management of operational performance. Smart alerts from enriched data communicate potential maintenance or safety problems before they occur, and help identify opportunities to improve productivity. Working with Bosch Rexroth we can provide a total solution, based on standards that improve the efficiency of the plant."

Real-Time Efficiency

Thanks to the collaboration between System Insights and Bosch Rexroth, VIMANA has had a significant impact on production at the manufacturing facility. The operation has seen a demonstrable improvement in machine utilization, due to operational decisions that are now made based on daily, real-time productivity data. Problem solving reaction time and skills have also improved with the ability to address problem areas on machines and proactively determine maintenance and productivity issues. On a higher level, the new software also helped the company with manufacturing operations corporate initiatives of improved visibility and performance.

Blueprint for Industry 4.0

The experience of working on a project which involved such a high level of standards-based connectivity and collaboration could serve as a blueprint for niche companies like System Insights moving toward Industry 4.0. Dr. Vijayaraghavan

doesn't think Industry 4.0. will be a one-size-fits-all solution. "You're going to have a plurality of vendors, a plurality of software systems, a plurality of hardware systems and a plurality of standards. Being able to work across all these systems, interoperating between them, is what's going to make these systems succeed. Our clients require solutions that provide interoperability, advanced analytics and enterprise integration so they can improve performance of their shop floors. It's a very complex ecosystem with complex problems in terms of legacy. Every country is different. Every market is different. Every vertical is different."

Rapp agrees. "Companies like System Insights have an edge because if it makes these open interfaces, it can provide solutions to many users to get all of their equipment on the same network. It's very rare, except with very large automotive projects, to have one machine builder that supplies 90 percent of the equipment in the plant."

"For Industry 4.0 programs to be successful we need to have collaboration," says Dr. Vijayaraghavan. "That's why standards are important. And, you can't have only one standard. You have to have multiple standards and be able to interoperate between them. This makes it possible for the end user to bring in a collection of experts to solve different aspects of a problem. Ultimately it's a means to an end where you're looking at better profitability, better productivity and faster turnaround. So, in order for those objectives to be maximized, you need to have much tighter interoperability across these Industry 4.0. systems." Both men agree that this project was a good example of that actually happening.

Since the project, System Insights began to offer OPC UA support in its MTConnect Adapter. Rexroth offers OPC UA servers in the CNC hardware L45/L65/L75/L85 with 14VRS.

| Reduce Stock | Paperless Shopfloor | Reduce Down-time | Shopfloor Transparency |
| Zero Setup Time | Staff Support | Increase Productivity |

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