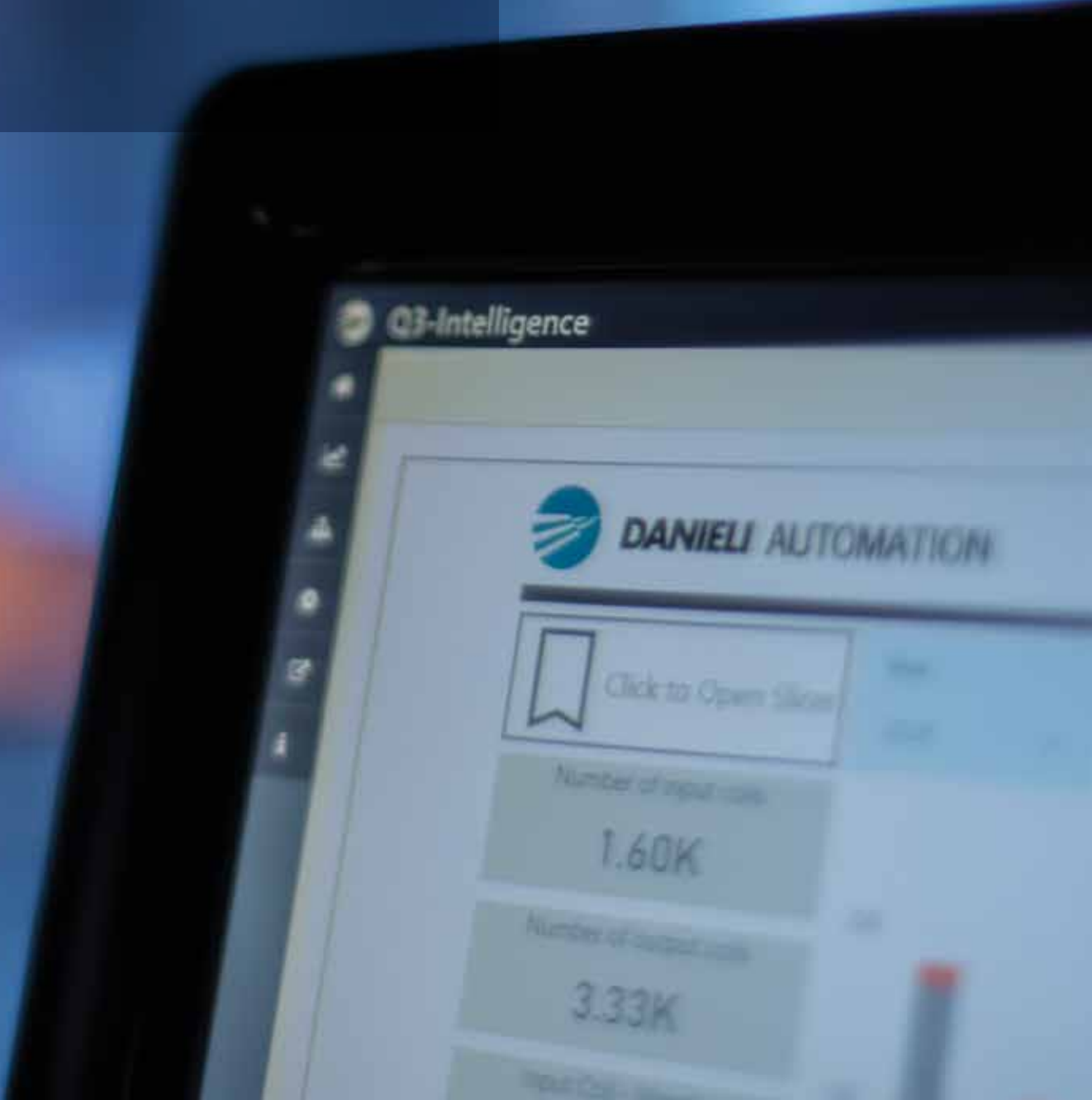


# Q3-INTELLIGENCE

Business Analytics  
for metals industry

DANIELI AUTOMATION





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# DANIELI AUTOMATION Q3-INTELLIGENCE

Within the DIGI&MET framework, Q3-Intelligence solution supports the digitalization of the most critical plant-wide processes covering the entire customer order lifecycle, from its acquisition up to material dispatch, through planning and execution steps. Q3-Intelligence definitely represents the platform where to implement the virtuous circle Measure - Gain Insights - Improve.



**DIGI&MET  
SIMPLIFYING  
METALS  
COMPLEXITY**

The challenge of the new globalized market and the current steel market outlook characterized by plant underutilization, are the elements leading metal producers to seek for low CapEx investments, aiming at improving the efficiency of the production facilities, the quality of the products, the health and safety of the workers as well as the environmental sustainability. In this scenario, Danieli has created a new business unit named DIGI&MET, which aims at driving its customers along their digital transformation journey, a two-steps path that, starting from granting the plant the capability to measure its processes, pursues the Intelligent Plant target. The Intelligent Plant is a safe, flexible, efficient and environmentally friendly concept

of manufacturing founded on the extensive digitalization of its processes, the deep integration of cyber and physical worlds and the strong interconnection of smart systems and humans. In an Intelligent Plant, systems and equipment autonomously execute complex tasks and support humans in complex decision-making or even provide decision-automation. Pursuing efficiency and product quality in the metals industry often implies, due to the huge number of variables involved and the relevant interactions, increasing complexity and consequently an increasing use of complex machines, processes or systems. In this scenario, automation and control systems cannot rely any more only on the experience of the domain expert, but rather on the considerable

amount of data characterized by undisputed speed and precision. The Data-Driven approach represents the most innovative and disruptive element among the ones introduced by the Fourth Industrial Revolution and aims at applying innovative digital technologies such as machine learning and artificial intelligence to extract knowledge from data for business and technological process optimization. In the metals industry this approach is not supposed to supersede the deterministic one but to integrate it, thanks to its capabilities of estimating process variables that are not observable, identifying process variables correlations and providing accurate results where process is too complex or chaotic. In other words, this approach has a key role in simplifying the metals complexity.



A photograph of a modern building with a curved facade and large glass windows. The windows are tinted with various colors like blue, green, yellow, and pink. The building is set against a blue sky with light clouds. The overall aesthetic is clean and contemporary.

**DIG&MET**

**BUSINESS  
ANALYTICS  
THE VALUE  
OF DATA**

Big Data is nowadays a ubiquitous concept: with this label, we define high-volume, high-velocity and high-variety information assets, coming from a number of data sources and connected devices. Such information endowment demands cost-effective, innovative forms of information processing, in order to obtain enhanced insight and decision-making support.

The proliferation of digital devices such as smartphones and sensors has led to an unprecedented rate of data creation and is driving a growing need for real-time analytics and evidence-based planning. Therefore, actions aim to optimize the transformation process, with great care for aspects like maintenance and energy and utility consumptions, in order to improve equipment availability and effectiveness. Such issues become business opportunities, since new IT technologies allow significant improvements both on financial and operational terms. Advancements in manufacturing industry require advanced techniques and technologies to enable the

capture, storage, distribution, management, and analysis of the information coming from the production and business levels. Enablers like massive quantities of data (Big Data), advanced analytics and the availability of cloud platforms are able to streamline and raise operational efficiency for industrial players. Such offer significant opportunities to industry players: Industry 4.0 is generating a lot of attention in recent years, and digitization has become the precondition to achieve competitive advantage. Applications range from real time condition monitoring and power consumption control; advanced analytics on both the fields of productivity and product quality; predictive maintenance and production scheduling; failure alert and alarms prediction. The key method to achieve business objectives is thoughtful application of state-of-the-art business analytics tools. Currently available analytics platform are assisting to an exponential growth, both in terms of functionalities and volumes of managed data.

The objective for industrial players is transitioning from a description-oriented logic (monitoring events) to a diagnostic-oriented one (ascertaining why events happen). The current scenario is market leaders to a predictive orientation (knowing in advance when an event will occur), enabling a proactive decision-making (how can I automatize the process in order to optimize it?).

The metals industry is not exempt from such needs: market needs have been constantly changing: production is lending from a quantitative aspect towards a qualitative aspect. The business focus is increasingly concerned with the improvement of product quality, reduction of consumables and energy consumptions, and pollution reduction. These concerns require aimed actions in new and existing production plants. A fast and challenging competitive environment demands rapid and effective decision-making: managers at all levels need proper instruments, based on state-of-the-art technology and domain expertise, in order to gain a competitive edge over their competitors.

**2.5 EXBYTE Data produced everyday**



**CONNECTED  
DEVICES**  
> 8 billions



**IoT BUSINESS  
DEVICES**  
>3 billions



**IoT BUSINESS  
INVESTMENT**  
>964 \$ billions



**DATA & ANALYTICS  
MARKET**  
>18 \$ billions





SAVED & STORED

Production & Inventory

Dashboard

- 10%
- 2.7%
- \$2,200,000
- \$2,800,000
- \$700,000
- \$400,000
- \$200,000



Category	Value
Category 1	100
Category 2	200
Category 3	300
Category 4	400
Category 5	500
Category 6	600
Category 7	700
Category 8	800
Category 9	900
Category 10	1000

**Q3-INTELLIGENCE  
BUSINESS  
ANALYTICS  
FOR THE METALS  
INDUSTRY**

Q3-Intelligence is the advanced data analytics and visualization suite for the metals industry. It allows users to analyze data in depth and from different perspectives, summarizing it into useful information. Q3-Intelligence combines Danieli Automation's extensive domain expertise in designing, manufacturing and commissioning automation

systems for the metals industry, with the vertical skills needed to realize business analytics systems. The platform is able to extract data from a wide range of heterogeneous data sources, transforming it into a uniform standard in order to load into a single source, ready for consultation. Q3-Intelligence is intuitive and

user-friendly, thanks to its advanced data model developed over several years of activity: users are able to extract useful business insights, without the need of special skills or the support of IT expert. Q3-Intelligence is a complete decision-making support tool, structured in different modules in order to address specific business needs.



**MONITORING**

The monitoring module is a web-based platform, allowing decision-makers to monitor in detail real-time plant performances. Data security and accuracy is ensured by the leading edge of technologies; the module is available for mobile devices and aggregates data to empower decision-makers, who are able to take decisions quickly and effectively, according to plant status.



**ANALYTICS**

The analytics solutions for the metals industry allows to access actual and historical information to support strategic decisions, increasing efficiency & productivity. This lets decision-makers take proactive actions through comparisons and correlations, between different plant areas' performances and quality results, in order to continuously drive the process towards the desired goals.



**PREDICTIVE**

With state-of-the-art of machine learning tools, users can do advanced mining of plant data. Thanks to the predictive module, the platform is able to produce in advance useful information for business, by applying advanced artificial intelligence techniques and leading computing technologies to the metals industry. Predictivity support metals industry players in letting data drive their own plants towards operational efficiency.



**MONITORING  
REAL TIME  
PLANT  
PERFORMANCES**



The monitoring module offer a customizable and device-independent environment by comparing the actual status with KPIs, allowing to keep the plant performances always under control. The design of the solution reflects a “top-down” approach. It starts with the monitoring of business KPIs and tracks production down to single product details. The key advantage of the monitoring module is providing the user a complete overview of plant performance in real-time, relying on aggregate data.

The module is structured according to two distinct front-ends:  
 > Reports distributed across the company, supported by a web-based Automated delivery system, to provide synthetic information in real-time.  
 > Dashboards, which represent a customizable and device-independent environment to control insights about plant performances. Dashboards allow information sharing, multi-media integration and a responsive design for users.

The monitoring module allows users to gather insight about a certain plant area, a specific variable, trends and deviation from operative goals; access to media content, in-depth insights relative to a certain period, social-media and pictures, is a standard feature of the platform. The approach adopted in defining the monitoring module allow decision-makers to take proactive actions through comparisons and correlations, assessing different plant areas’ performances and results.

					
<b>MOBILE DEVICES</b>	<b>REAL-TIME INSIGHTS</b>	<b>DATA SECURITY</b>	<b>AGGREGATE DATA</b>	<b>WEB ACCESSIBLE</b>	<b>REPORTS &amp; DASHBOARDS</b>







**ANALYTICS  
IN-DEPTH  
INSIGHTS**



The Analytics module allows to access actual and historical information to support strategic decisions, increasing efficiency & productivity. The objective is gathering in-depth insights, focusing on anomalies and key success factors emerging from aggregate data. The platform is able to target plant data sources in a flexible manner: metrics, variables and goals are defined according to a rich KPI library specific to the Metals Industry. Measures and thresholds can be evaluated according to a number of analysis dimensions and filters, customizable by users. The module provides a self-

service business analytics tool: it is based on leading edge technologies in the field of data analysis and visualization, and the data model can be natively interrogated by different Microsoft tools, MS Excel and Power BI. Both of them are connected to the centralized Q3-Intelligence Semantic Data Model, developed over years of experience and research. The flexibility of the application allows ad-hoc analysis, providing the possibility of carry out drill down to details. By using MS Excel, you are able to leverage existing IT investments, exploiting a rich and customizable visualization.

A set of templates is provided, based on KPIs and variables designed in years of careful analysis and enriched by Danieli domain know-how. Power BI is imposing itself as the leading tool for data analysis. It is configured as a ready and easy to use application, enabling multibusiness monitoring and self-service insights for users. Based on advanced analysis templates, it offers the possibility to share contents with colleagues in a collaborative environment. Native integration with mobile devices enhances the convenience to consume analysis for users.

					
<b>MOBILE DEVICES</b>	<b>IN DEPTH INSIGHTS</b>	<b>HI-FREQUENCY DATA</b>	<b>SELF SERVICE BI</b>	<b>MS EXCEL FRONT-END</b>	<b>MS POWER BI FRONT-END</b>

The Predictive module foresees in advance behaviours and trends; it supports the users to make accurate and timely strategic decisions.


The predictive platform uses machine learning techniques to quickly define and deploy several plant processes models and anticipate significant events and variables specific to the metal industry. Machine learning provides a predictive model in an accurate and timely fashion. The Q3-Intelligence machine learning engine facilitates user interaction with complex



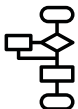



algorithms, enabling quick statistical model deployment and training for forecasting.

The machine learning process is performed by exploiting the state of the art of computing services, which can process a large amount of data, in combination with advanced languages like Python and R. By using Q3-Intelligence as real-time user interface, it's possible to make available useful information coming from forecasting to decision-makers, at any time and from any device (smartphone,

tablet, desktop). Moreover, it is possible to integrate prediction results into operator workstations in order to support the user in his daily activities with advanced and useful insights. In this way, players in the metals industry can achieve several business goals: improving productivity, raising operative efficiency, set-up tuning, improving products quality. By predicting key variables trends in advance, significant cost savings can be attained, preventing anomalies, stops and failures.

**PREDICTIVE  
PLANT BEHAVIOUR  
IN ADVANCE**



					
<b>MACHINE LEARNING</b>	<b>DATA DRIVEN</b>	<b>ADVANCED ALGORITHMS</b>	<b>CONSULTANCY SERVICES</b>	<b>ANTICIPATE EVENTS</b>	<b>CLOUD READY</b>

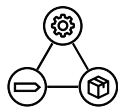


## DATA SOURCES

One of the main features of the Q3-Intelligence suite is its easy integration with any automation and IT systems, and its native integration with Danieli's own systems. The analytics suite is able to track data coming from both MES (Manufacturing Execution System) and PCS (Process Control System) data sources. A number of technological

packages coming from Danieli offering are naturally integrated with Q3-Intelligence, enabling fluid and synergic insights for decision-makers. In addition to its ability to gather data from plant databases, Q3-Intelligence is constantly updated in order to extract information from new data sources originated by the Industrial Internet of Things (IIoT) revolution: data coming from

machines, gauges, sensors and cameras is constantly tracked down, monitored and analyzed to gather business insights. Furthermore, the flexibility of the Q3-Intelligence analytics suite allows to easily adapt it to the vast majority of devices and softwares provided by market players other than Danieli.



### ERP/MES

Manufacturing Execution System L3



### PCS

Process Control System L2



### CMS

Condition Monitoring System



### CMMS/EAM

Maintenance Management System



### EMS

Energy Monitoring System



### AUTOMATION

L1 and Technological Packages

## PLANT DATA

Easy and seamless integration with plant data sources is the key success factor to acquire vital insights about production and business processes. The analytics platform is able to provide useful information to decision-makers coming from both production and supply-chain levels. Integration with MES data sources enables active monitoring and analytics on business processes, ranging from order management, order dressing,

production scheduling, production progress control, inventories and shipping. A complete apical view on aggregate data, based on MES databases from Danieli Automation or other market players, provides an invaluable support tool to decision-makers. This overview is completed by the possibility of obtaining a much larger degree of detail from PCS data sources, focusing on production processes: the

Q3-Intelligence platform is able to interact with Danieli Automation's PCS systems or third-party suppliers, allows an in-depth monitoring and analysis on production variables like temperatures, energy consumptions, alarms and events according to product tracking. Each analysis can be further examined in depth, according to customizable dimensions ranging from date, shift, product features, equipments.



### MACHINES



### GAUGES



### SENSORS



### CAMERAS



### PLANT DATABASE



### EXTERNAL DATA



DANIELI  
MORGAN HAMMAR



136 MES01 - VBKP



## KPI LIBRARY

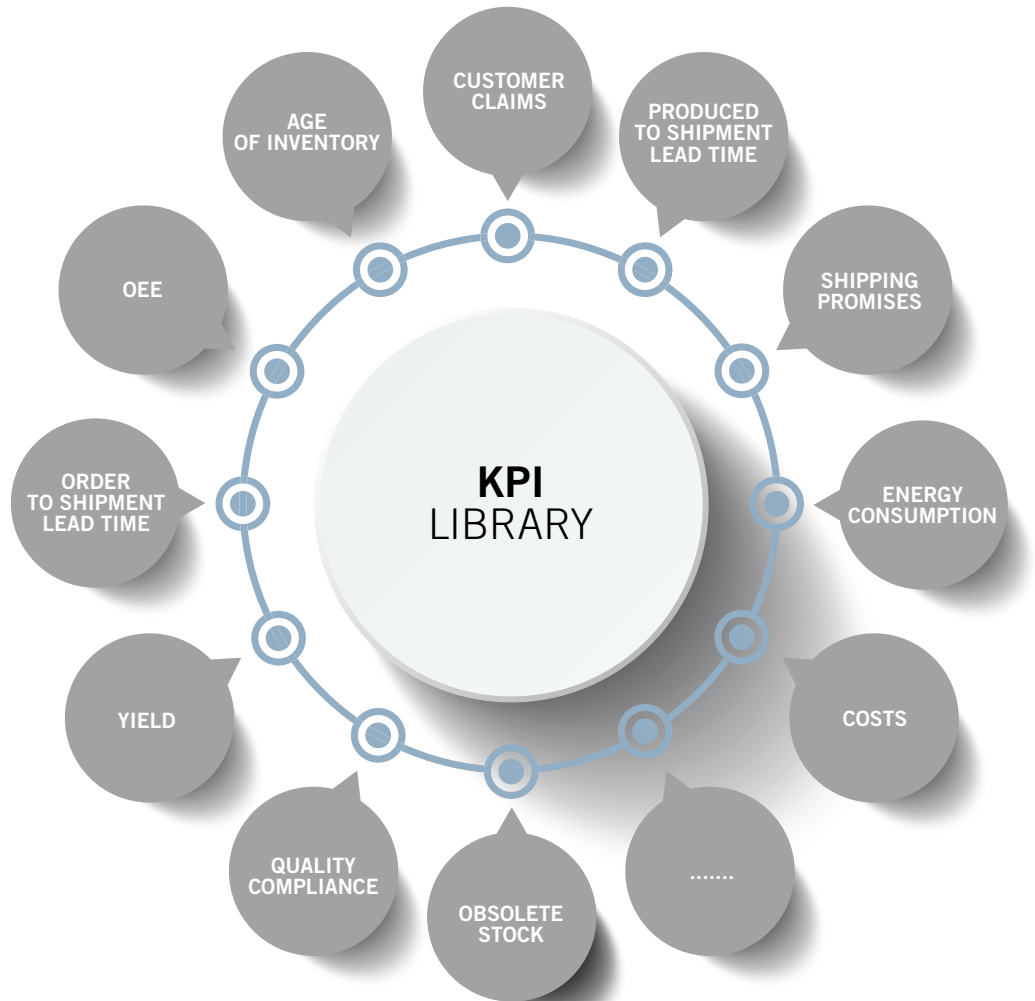
Thanks to Danieli domain expertise, the Q3-Intelligence platform bases its information richness on the vast quantity of data gained by plant data sources.

Historical DBs are used as data sources for Q3-Intelligence dedicated data warehouse: in this way, Q3-Intelligence is able to feed data for both the monitoring and analytics part, assuring coherence between databases.

This knowledge is based on a comprehensive KPI library, defined in over a decade of

experience in the metals industry. Q3-Intelligence modules track several thousands of production and process variables, covering overall aspects from both production and business processes: this allows decision-makers to get a comprehensive view on plant performance, while enabling them to get thorough insights and highlight specific trends and events. Data ingestion based on well-determined thresholds and limits provides valuable support for business strategy at all levels.

Key metrics range from chemical analysis, mechanical properties, production traceability, raw materials consumption, energy consumption, consumables, quality and productivity metrics among others: thanks to the know-how accumulated in several years, the design of the Q3-Intelligence solution guarantees a seamless and entirely customizable implementation, according to client requirements relating to peculiar variables and needs, all of them significant for his own plant.
















**SUPPORTED  
BUSINESS  
& TECHNOLOGICAL  
PROCESSES**

**THE ENABLERS**

 <p><b>DATA INGESTION &amp; MODELLING</b></p> <p>Customized data model tailored on metals industry needs</p>	 <p><b>CONSOLIDATED KPI FOR METALS</b></p> <p>Reduce data analysis time and extract relevant information</p>	 <p><b>CUTTING EDGE OF TECHNOLOGY</b></p> <p>Enhance IT infrastructure leveraging on cloud or on-premises installations</p>
 <p><b>REAL-TIME DYNAMIC REPORTS</b></p> <p>Real-time fully configurable web dashboards per each production area</p>	 <p><b>USER-FRIENDLY INTERFACE</b></p> <p>Boosted data analysis capabilities with ready to use templates</p>	 <p><b>ARTIFICIAL INTELLIGENCE</b></p> <p>Consolidated and easy-to-use machine learning and statistical data information</p>
 <p><b>PLANT OVERVIEW CROSS-PLANT BENCHMARKING</b></p> <p>Analyze single plants or analyze multi-plant sites</p>	 <p><b>CONSULTANCY SERVICES</b></p> <p>Multidisciplinary consultancy team to empower analysis (e.g. data scientists, production experts)</p>	 <p><b>DATA CONSUMPTION</b></p> <p>Access your data from everywhere and everytime</p>

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