

Movicon Pro.Lean[®]



Lean Manufacturing: Performance, OEE and Downtime Analysis



Movicon Pro.Lean[®]

“Having full access to real-time production data enables you to detect and anticipate weak spots in the production system and to make the right decisions to increase productivity and efficiency”.





Technology and Solutions for Plant Intelligence

Progea's Lean Manufacturing and Plant Intelligence software solutions improve productivity, reduce losses and increase profits.

To enable Overall Equipment Effectiveness (OEE) companies need simple but effective tools that can ensure data acquisition, aggregation and transparent analysis with rapid returns (ROI) on minimum investments. The production reality today in an increasingly competitive world demands efficiency and quality with continuous and improved processes according to Lean Manufacturing principles. Automation systems that manage production processes can only be optimized if provided the right information. This can be achieved by using lean tools that are easy to apply but get maximum return. The Movicon Pro.Lean® module offers maximum efficiency using Progea's twenty years of experience in industrial automation software. Often production lines are subject to various causes that weaken performance: malfunction, downtime, scrap and rejects reduce production efficiency, causing economical loss to the company. Companies are usually inadequately equipped to remedy these losses.

indicators (KPI) enables Overall Equipment Effectiveness (OEE) values to be calculated in order to indicate the real plant production efficiency rate.

On average, a well-established manufacturing company performs up to 60% of its full potential performance capacity. This means that for every 100 approved goods produced in an ideal situation, only 60 are actually produced. Considering that the 100% value is purely theoretical, an 'excellent' value of a true lean production would be around 85%. It is easy to imagine how improved production efficiency and an increase in the OEE value would create a noticeable increase in returns for any company, without investing large amounts. For example, it is quite easy to imagine how a mass production manufacturing company can increase profits and reduce loss by improving and increasing their performances by a small percentage.

The automatic real-time knowledge of the performance

Information flows enterprise-wide from production plant system sensors through to the managerial offices, efficiently managing real-time production process. Pro.Lean® is the solution for improving productivity efficiency, reducing loss and increasing profits.





Key Performance Indicator (KPI) knowledge of the production process is crucial for eliminating weak spots and increasing performance

Pro.Lean® is a simple and effective solution based on reliable, open and flexible technology.

Pro.Lean® is the ideal solution to aid decision-making. It is a Movicon functional module designed for measuring global efficiency values in real-time. It does this by collecting and aggregating production process data deriving from the different data sources at production level (PLC, HMI, SCADA) and analyzing the real-time situation with benchmarks to show the production level indicators in general, independent from the deriving data source. Production managers can use this data to aid decision-making and promptly act to eliminate inefficiencies. Together, Movicon and Pro.Lean® offer secure and efficient connectivity tools for collecting real-time information directly from the source or origin. A configuration wizard aids users to associate data and create databases automatically and safely with the aim to produce an OEE project with immediate results within a few hours.

This solution is also open to customization of field communications, dashboard displays and analytical Reports. Predisposed ODBC connectors enable bidirectional connections with managerial systems that allow simple MES solutions to be created. These include solutions such as managing and launching orders or production batches or synchronizing and co-ordinating processes and resources. Pro.Lean® enables the availability of immediate KPI and OEE value calculations, to record the causes of downtime events and to present productivity dashboards according to the criteria defined by the standards, which can be customized. The KPI and OEE indicators can be displayed in web architecture using common Internet browsers.





■ Real-time information for detecting and eliminating inefficiencies to improve productivity

Pro.Lean® will make plant system more efficient by highlighting those key indicators that enable reduced loss and increased profits.

The KPI indexes, OEE value and downtime production analysis calculated by Pro.Lean® will enable companies to maximize production by increasing productivity in the three main parameters: Availability, Performances and Quality.

Increase Efficiency

Improving local and global production efficiency will enable users to make better use of existing productivity machines and reduce rejects and downtimes. As a consequence this will reduce plant operational costs to satisfy production plans without needing to rely on overtime work and the threat of delayed delivery deadlines.

Reduce Machine Downtime

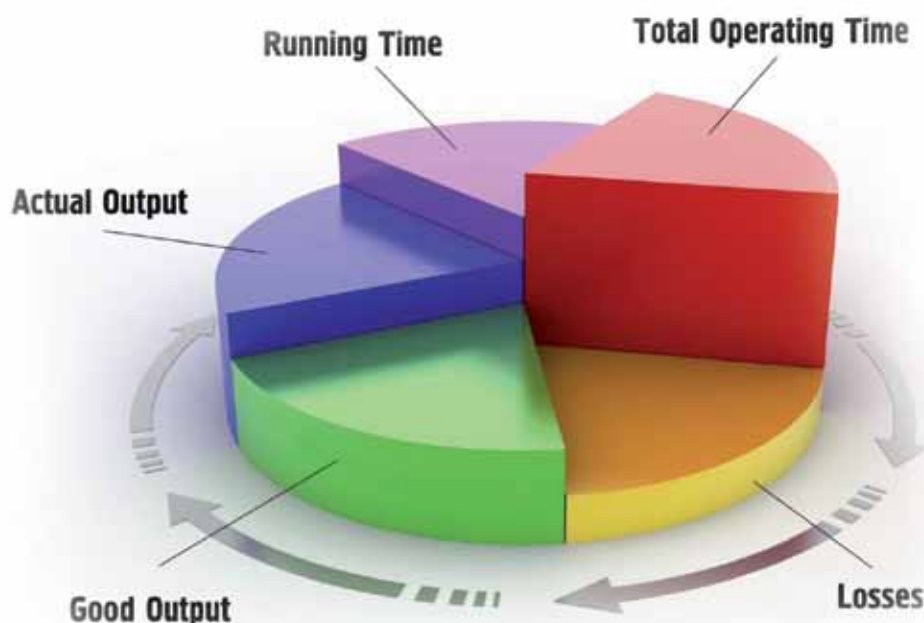
The downtime analysis will enable you to eliminate anticipated and repetitive problems relating to production. This will enable a reduction in plant downtime events, resulting in a significant reduction in costs and more efficient allocation of human resources.

Increase Production

By increasing efficiency and decreasing downtime events caused by production inactivity or malfunctioning, users can increase the effective production rate of the plant capacity value.

Quality Improvement

By analyzing data for defective productivity users can detect the causes and eliminate them. This reduces production waste and rejects, increasing product quality and client satisfaction.





How can the OEE be increased?

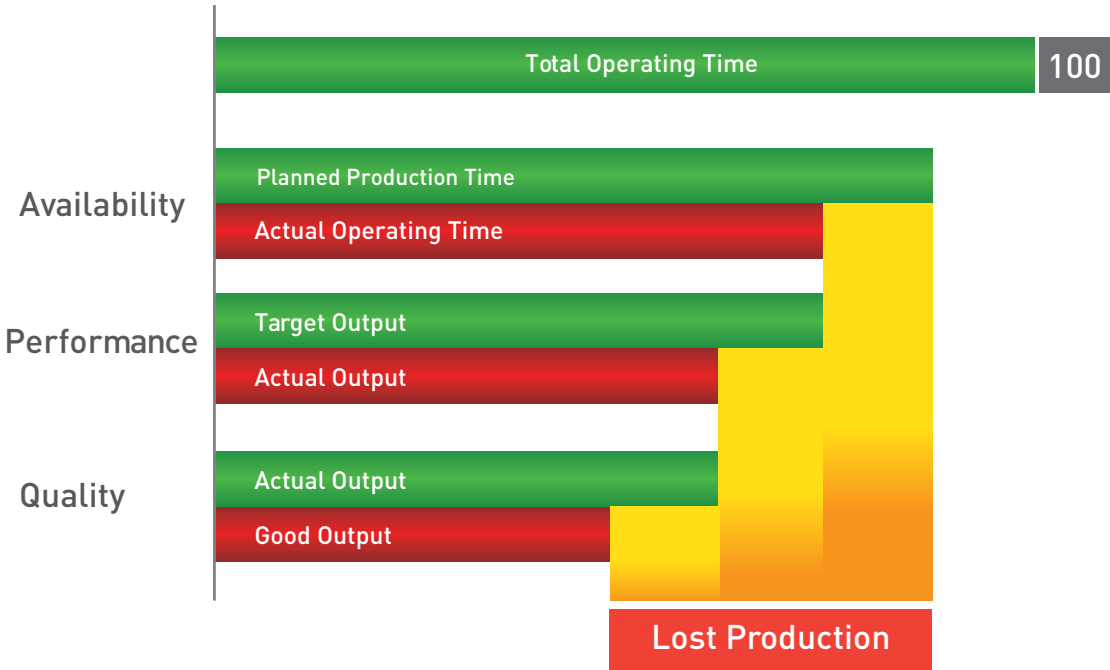
The OEE is an essential reference point for analyzing production process efficiency and productivity by calculating the overall performance of the plant and classifying the different production losses according to the three following factors:

- Availability
- Efficiency
- Quality

The accuracy of the OEE values depends on consistent production data collected automatically in real-time mode. Without accurate measurements and access to production data it would be impossible to identify the right interventions for making the production process more efficient. This is why Progea has designed Pro.Lean® to be the most simple and cost effective solution to use. Production line information can be aggregated and placed at the disposal of company managers with great clarity and simplicity. This tool is essential for closing the gap that is often created between the field production processes, company management and planning. Pro.Lean® is based on Industrial Connectivity and Data Collection technology and has been tested with Movicon for many years by Progea. The Pro.Lean® module provides automatic and intuitive management of the Historian component for collecting and recording data, the Dashboard component for displaying the key indicators KPI, OEE) in real-time and Reports for analyzing data collected and archived by date, shift, operator,

machine, product and batch. With Pro.Lean® each company will be able to discover the real production capacity of their systems, production lines and machinery. Pro.Lean® facilitates the detection of critical weaknesses and imperfections by providing the information needed to eliminate them and improve overall efficiency. This will give production plants the opportunity to increase their value, improve productivity and increase profits while reducing investment recovery time and strengthening the company's competitive presence.

In today's global economy, manufacturing companies cannot risk becoming inefficient and non-competitive. It is critical to reduce production costs, improve production line and machine use and flexibility to improve not only product quality but service as well. Pro.Lean® offers cost containing tools for collecting real-time information from production flows and analyzing the coefficients of efficiency using tables and graphs in an open and integrated web-enabled architecture that also enables direct connection to the company IT tools (ERP, SAP).



Dashboards and Reports with quick, reliable and clear information

Pro.Lean® offers efficient, complete, fast and transparent performance.

Pro.Lean® has been designed to guarantee perfect visualization of all the performance parameters and indicators collected by the production system using the real-time data dashboard displays and analytical reports. These tools offer transparent and accurate data containing all the information needed to achieve reduced production loss and increased business activity. By using the Movicon technology combined with the Pro.Lean® module, you can view your company's performance indicators on local video screen monitors with dashboard displays as well as over the Internet by using a simple browser. This will drastically cut management, maintenance and licensing costs more than any other OEE system on the market, allowing you to minimize company investments.

Dashboard Data

The collected data is represented by the Pro.Lean® module in real-time using attractive graphical dashboards to display indicators and operating statuses with great clarity. Operators will be able to supervise and control all productivity processes anywhere, anytime, by using the web interface graphics.

The dashboard interface has been designed with the latest ergonomic requirements in mind equipped with the option to customize. The integrated and advanced supervision and control functionalities enable the module to function as a supervisor.



OEE and Downtime Analysis Values

The OEE indicators (Overall Equipment Effectiveness) are recognized as the most effective key indicators for measuring overall plant system efficiency. The OEE is aimed at assisting enterprises with maximizing market output by increasing productivity in the three key areas: availability, performances and quality. Real-time data acquisition combined with the OEE analysis make the Pro.Lean® module an essential tool for any manufacturing company business manager. With this module, managers are able to develop a better understanding of the production area performance and identify the factors restricting opportunities to improve efficiency. Pro.Lean® does this by offering a vision-wide perspective correlating the productive and functional aspects, production rates and quality using common metrics to provide unique calculated performance measurements. The OEE calculations take three factors in to account:

- 1. Availability** – takes into account Down Time loss and is calculated on the percentage of effective operating time in respect to planned production time.
- 2. Performance** – takes into account Speed Loss and is calculated on the percentage of pieces effectively produced in respect to programmed target total and ideal run time.
- 3. Quality** – takes into account quality loss and is calculated on good pieces produced and total number of pieces produced.

These indicators are applicable using Time Range, Production Line, Machine, Shift, Batch and Operator filters.

$$\text{OEE} = \text{Availability} * \text{Performance} * \text{Quality}$$

This crucial information enables managers to establish means of improving asset productivity, machine efficiency and production time as well as reducing waste.

A calculated low OEE value will inevitably cause the company an increase in production costs and consequently a reduction in profits and opportunities. This would mean that a production line running 24/7 would lose 4% of its productivity potential for every hour lost in a production downtime event. By analyzing production data to detect the bottlenecks and downtime causes, the company is able to take immediate action to reduce loss. For instance, by recovering just 2% loss means that the weekly production rate will retrieve 3.5 hours of productivity time. On an annual basis this will mean an additional 168 hours of productivity. A simple 2% production recovery translates into a significant increase in profits.



The screenshot shows the 'OEE Summary Table' for the date range 10/04/2014 to 10/04/2014. The table has columns for Date, Machine, Shift, Job Description, Total production, Good and waste, Scrap and waste, Quantity, Availability, Performance, Quality, and OEE. It provides a detailed breakdown of OEE performance across different machines and shifts.



Today, based on a theoretical OEE value of 100%, the most efficient and highly productive company will generally reach an OEE value equal to 80-85%. Without using any control methods most companies operate on average at an OEE value level of around 60%. Therefore it is paramount to take into account how the opportunities offered by the OEE indicators will reduce loss and increase profits.

The Downtime Analysis

The performance indicators alone are not enough to detect the causes of inefficiencies. Data collection systems need to be evaluated for their capacity to provide the right information that enables detection of the macro causes that drive productivity loss and diminish performance. This information is essential to ascertain what and where the causes of inefficiency are in order to eliminate them. This requires the full cooperation of the operators to not just control alarm events, automatically triggered by the system, but to establish the reasons why production downtime events occur in the actual machinery being used (e.g. format change, setup, raw material shortage, scheduled maintenance, meetings and work breaks). Pro.Lean® includes analysis modules for DownTime event causes that generate a statistical analysis of the downtime

causes based on various and configurable reason options. Production managers can refer to this analysis to obtain the vital information they need to recover efficiency, implement corrective intervention and improve production management.

The Statistical Analysis

The DownTime Analysis Module is used for visualizing statistical data relating to production downtimes. This is done by graphically representing data in classification of date order, total duration or event frequency. The values displayed in these classifications are extracted from historicals and represented in graphs that offer a selection of different data filters that include by time range, batch, shift or operator. The graphs can be displayed and printed as histograms or with statistical data represented by overlapping curves. In addition to the statistical calculations and graphics the system also provides data summary tables in detailed report format to represent all the data filtered.

Pocket Analysis for Mobile Systems

The integrated Web and Web Client technology will enable access to performance indicators using any Smartphone and Tablet from wherever you may be!





Communication

Real-Time DB with integrated I/O Drivers, OPC and DB connectors for total connectivity.

Communicating quickly and securely is essential to enable MES systems to provide all the necessary real-time data where needed. With Movicon integrated Pro.Lean® is able to represent the gathering point of process data as a crossroads of the company production system information flow. The strategic role of communication is essential, and Pro.Lean® provides all the necessary tools to ensure that the flow of information is smooth, fast and transparent.

I/O Drivers

The I/O Driver library contains a vast selection of native and integrated I/O Drivers for communicating with control systems (PLC, CNC, instrumentation, Fieldbus).

OPC

Both Client and Server OPC DA, OPC DA XML technology has been integrated. OPC UA is also available as an option.

Networking

Vast network connectivity in distributed workstation networks to include WinCE HMI panels as well.

DB Connectors

Special input and output DB connectors to any database, application or company system using simple shared tables for connecting to any managerial system (ERP) or company SAP systems. This makes Movicon Pro.Lean® the best system for connecting managerial levels with production levels thus enterprise-wide connectivity to make production data easily available to top company levels in real time.



Historian

Process data is archived in SQL Server™ relational database.

All the process data collected by Movicon Pro.Lean® is recorded and archived for subsequent analysis using the Data Logger objects that are created automatically by the Pro.Lean® configuration wizard.

The configurator enables simple data aggregation and defines the recording and archiving modes. This important task guarantees the simplicity, reliability and openness concepts. It is not necessary to have a Microsoft SQL Server license for Pro.Lean® to work in a simple architecture. The data tables are structured automatically and the calculation database provides all the information needed for quick and effective analysis in dashboard and analytical report viewers. The simple object-based configuration enables real-time data to be custom managed, displayed and recorded due to the Movicon platform architecture design where Pro.Lean® is a functional module.

Data collection openness

The collection of alarm data and machine downtime event, if not already available as digital information from the PLC, may require HMI interface on the local production monitor. The Pro.Lean® architecture is ideal for connecting remote workstation terminals, whether Web-based or local HMI on operator panels based on Windows CE at a low cost. The Pro.Lean® system has powerful and integrated tools to enable collection points of data containing information on downtime events when required. In cases where operator workstations are already equipped with an HMI system, the Movicon Pro.Lean® web interface can easily be installed internally to protect investments without needing any complicated interventions.

Data Redundancy

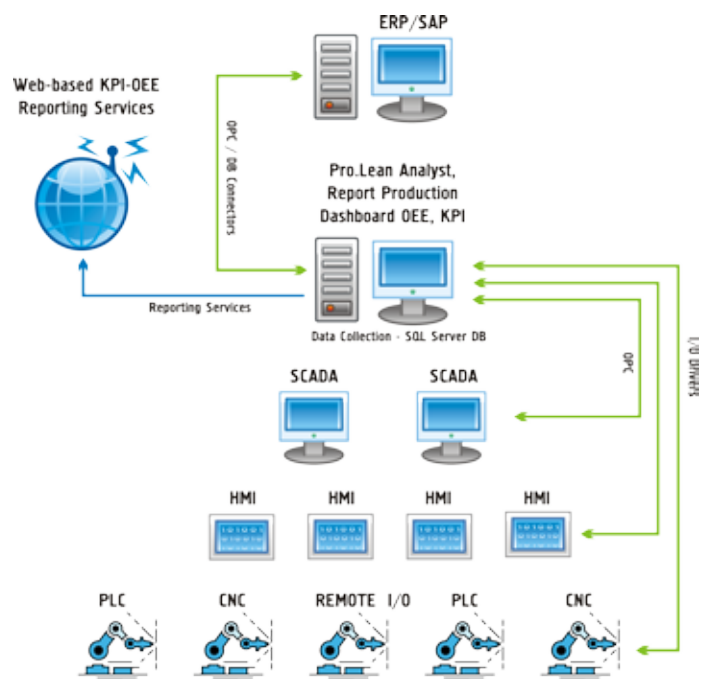
Movicon Pro.Lean® offers a Data Redundancy function for automatic synchronization of historical data in PC systems with redundant hardware and communications in "Mission Critical" data collection systems.



Open and flexible architecture

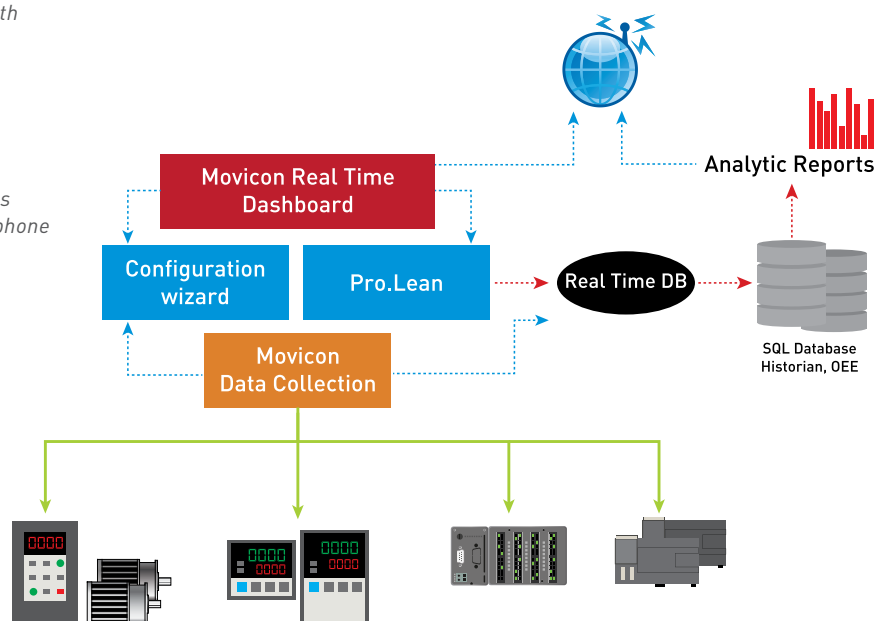
Pro.Lean® uses the consolidated Movicon architecture for communications and data collection

Thanks to Movicon Pro.Lean® users can insert MES system directly by connecting it to production lines without having to worry about which connection modalities to use. Pro.Lean® has a variety of integrated solutions to enable connectivity towards production process systems by means of using I/O drivers designed for connecting PLCs, CNCs, Remote I/O directly. In addition, there is the option to use OPC Client or Server connectivity towards HMI or production line pre-installed SCADA systems. This will enable data collection without incurring heavy investments and additional installations on the production side. Data is aggregated and stored on Ms SQL Server Relational DB tables. The OEE and KPI performance indicators can be displayed locally or by remote control made possible by the Movicon Pro.Lean® web architecture. This system enables full bidirectional connectivity with ERP or SAP systems for total information flow control throughout the shop floor through to the director's office for complete enterprise-wide top to bottom coverage.



An extremely simple, cost efficient solution with the use of consolidated technology and all the components required for:

1. Field communication
2. Historian and Data Collection
3. Real-time Dashboard
4. Analytical OEE and Downtime Reports
5. Operator terminal downtime event entries
6. Web accessibility from tablet and smart phone

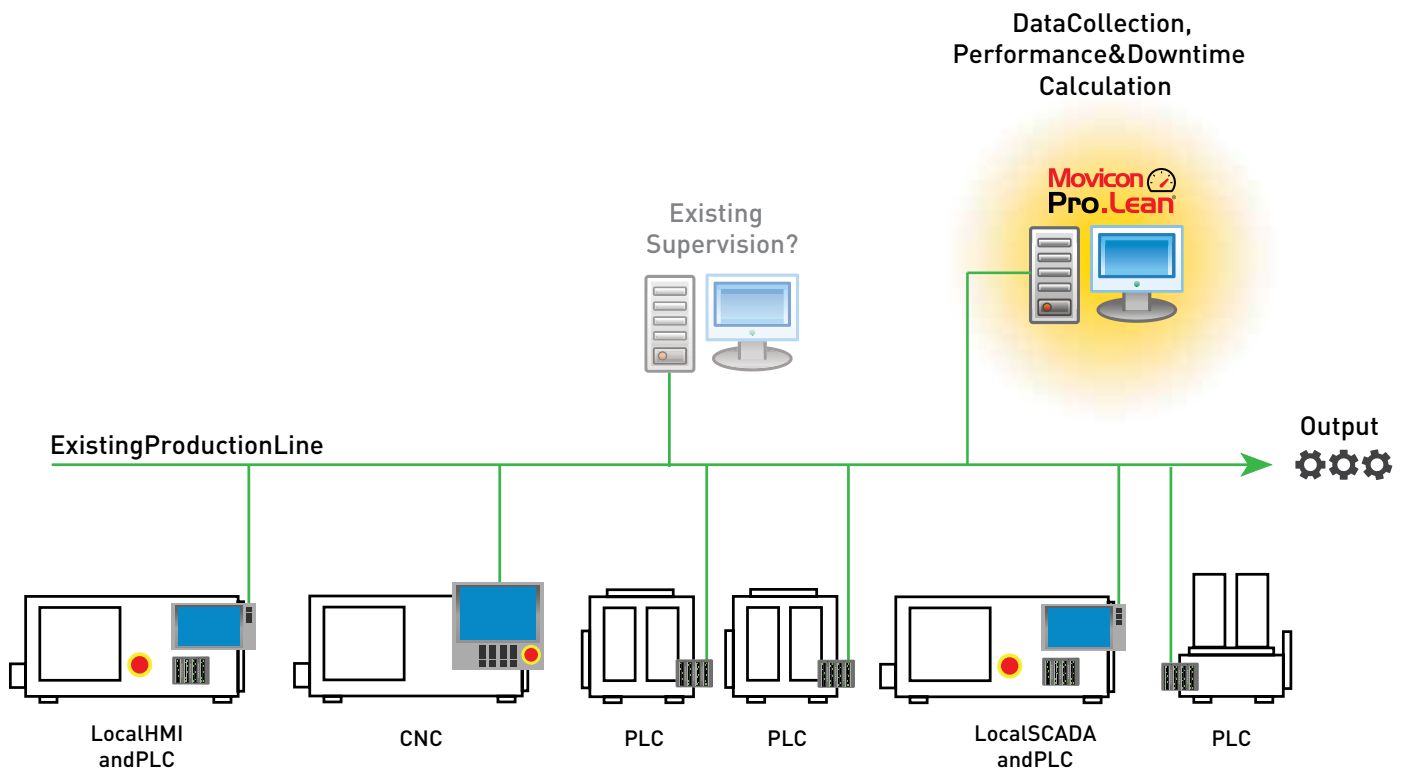


Application Examples

Pro.Lean® can be applied anywhere in any production process and existing automation infrastructures with minimum investment.

Pro.Lean® is a “standard” solution that can be used in all production data and analysis applications. It can be applied as an onboard machine module or as a production line supervisory module combined with the Movicon SCADA/HMI supervision projects, or in independent or stand-alone architectures applied in already existing systems. Pro.Lean® can connect to existing PLCs or SCADA/HMI by collecting production information in its databases. Existing PCs can be used by the local machine operator to track downtime event entries by using a simple web browser (without modifying the local application) if the

PC is connected to a network or simple operator panels that are connectable to Pro.Lean®. Pro.Lean® also offers a solution for those without a main Supervisor, whereby display screens can be integrated to manage all production line information. This has all been designed with the best technology available for collecting, managing and analyzing production data along with the purpose to keep investments reduced to a minimum without having to modify existing situations unless absolutely required.





■ Technical support and services are our added value

**Openness, Integration, Customization, Support.
Progea satisfies every need.**

Along with its network of Partners, Solution Providers and System Integrators, Progea provides clients all the support and services necessary to achieve project success. Setting up the project and tailoring it to specifications of each company requires skill and expert know-how and plays a crucial role in guaranteeing success of the entire project. Progea is highly qualified in providing client assistance by analyzing their specific needs, putting them into the right context and implementing until fully validated and working to client satisfaction. The OEE (for a machine, production line or entire factory) only indicates the level of production system performance that alone cannot be used to improve productivity. It must be combined with the cooperation of all enterprise-wide level personnel, from shop floor to managerial offices, working together to eliminate the causes indicated by the OEE. This practice enables success and a secure future for your company.



Progea has been producing industrial automation software platforms since 1990, with a consistent focus on quality and innovation. Progea's top priority is quality: the company is ISO 9001:2008 certified and their software products undergo strict testing with certification based on the required standards. Their services are provided by a motivated and highly professional team, fully focused on specific client needs and providing client satisfaction proven by numerous partner references that include Phoenix Contact, ABB, Panasonic, Asem, Vipra, Suetron and many more.



■ The Key Features

Openness. Pro.Lean® is a Movicon functional model with Server and XML-based architecture.

Security. Pro.Lean® guarantees maximum data security based on SQL Server with redundancy management.

Standards. Pro.Lean® is completely based on standard technology to safeguard the investment.

Performances. Pro.Lean® ensures real-time management of information with the capacity to handle data collection with a frequency up to 10 Ms.

Powerful Data Logging. Collected data can be recorded using the Data Logger objects to record on SQL Server archive tables with automatic data recycling.

Connectivity. Pro.Lean® integrates a library containing a vast selection of communication drivers for connecting to all types of automation devices (Modbus, Siemens, Schneider, Rockwell, Omron, Saia, Mitsubishi, Profibus, Profinet, Ethernet/IP and many others). The drivers include functions for automatically importing tags, remote connectivity via modem, the multi-station concept for point-to-point protocols. In addition to the driver library Pro.Lean® offers full connectivity via OPC with OPC DA, OPC UA, OPC XML DA technology as both Client and Server.

Configuration Wizard. Pro.Lean® is a Movicon functional module equipped with a configuration wizard to enable easy field variable selection and the automatic creation of data acquisition databases. Real-time Dashboards, calculation databases and analysis reports are created with a few simple step-by-step procedures.

Ready-to-Use and Customizable Reports. Pro.Lean® is already equipped with performance and Downtime Analysis Reports based on the SQL Server Reporting Service. In addition, this solution also offers the use of the Movicon Report Designer or Crystal Report tool for greater integration and customization.

Web-Enabled Architecture. Pro.Lean® offers web-based OEE dashboards, HMI interface and Reports. Data can be access on the Server by using Internet browsers. Performance and security ensures reductions in costs and maintenance.

Open and Customizable KPI Analysis Modules.

The KPI analysis proposes simple and effective solutions for obtaining straightforward, quick and open OEE and Downtime indexes. Reports, Tables and graphs enable a thorough analysis of the production process with the option to print and export the data displayed. All the data is managed in customizable architecture.

Integrated Connectivity with Movicon. In addition to interfacing with any supervisory system, Pro.Lean® also offers the advantage of using network connectivity with the Movicon SCADA systems and with WinCE HMI panels based on Movicon CE.





■ Immediate return on a small investment
by increasing performance and reducing loss in
any sector of manufacturing



