

Software Solutions for Manufacturing Excellence

Introduction to camLine





camLine GmbH has been in business for more than twenty-five years providing software solutions and services to high-tech manufacturers. In this brochure, we give an overview of the products and services offered by camLine.

Manufacturers' persistence in striving for Excellence conjures associations with the mindset of athletes participating in the Olympic Games. The Olympic motto is made up of the three Latin words "citius, altius, fortius" which means faster, higher, and stronger. Clearly, you as an industrial manufacturer do not intend to win medals in sports which are still limited in number and in time. You want to remain within the existing market and to expand in other markets or become a leader within your market segment.

In manufacturing industries, Manufacturing Excellence has emerged as the key to

sustainable revenue and business growth. It calls for a mix of ingenious approaches or methods leading to outstanding operational results. This creates a workplace in which all become subject to lean thinking, continuous improvement, and constant reviews. Your pursuit of achieving unbeatable standards in all business aspects leverages concepts such as total quality management, continuous improvement, international benchmarking, and flexible working.

All continuous improving of current activities aims to one fundamental aspect, which is your intention to create value. The end of this tunnel leads to the one and only purpose, the focus on your customers' needs. Exactly with this mindset, camLine strives to support you with your goal to assert yourself as the world class manufacturer in your business. camLine provides excellent software solutions for manufacturing which are process oriented across the value chain and enable you to increase productivity, effectiveness, and efficiency.

camLine

A company
founded in 1989

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Business type:

IT partner specialized in
Software Solutions for
Manufacturing Excellence

camLine's software solutions
are designed for extreme
reliability and massive data
throughput to meet the
requirements of a
24/7 production environment.

Management:

Heinz Linsmaier: CEO, marketing & sales,
product development
Bernhard Jofer: VP in integration services
Georg Ruetz: VP in finance & administration
Bryan Ng: VP in business development
Mitch Goh: VP in support services

camLine subsidiaries:

Singapore, New Taipei City (Taiwan),
Dresden (Germany), Atlanta (USA)



Mission

Increase manufacturing productivity
through the provision of full IT services to
industrial manufacturers.

Geographic presence:

Worldwide customer base

Certification:

DIN EN ISO 9001:2008



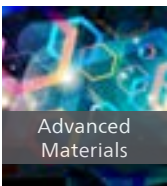
Expand your technological lead and secure a future competitive position.

Markets served:

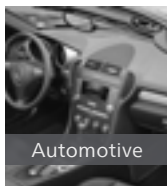
High-tech manufacturing industries with production environments of 24/7, including:

Solutions for:

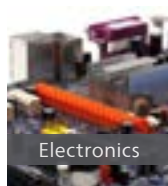
- Enable Industry 4.0 and IoT
- Managing quality within the supplier and manufacturing chain
- Keep your equipment running
- Provide full traceability within manufacturing
- Manage R&D planning, execution, and reporting



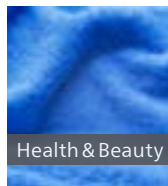
Advanced Materials



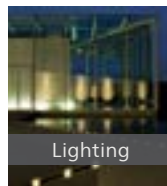
Automotive



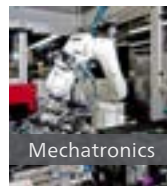
Electronics



Health & Beauty



Lighting



Mechatronics



Medical Devices



MEMS



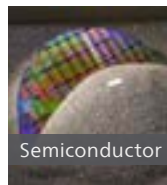
Nanotechnology



Photovoltaics



Research & Development



Semiconductor



Storage Battery



White Goods

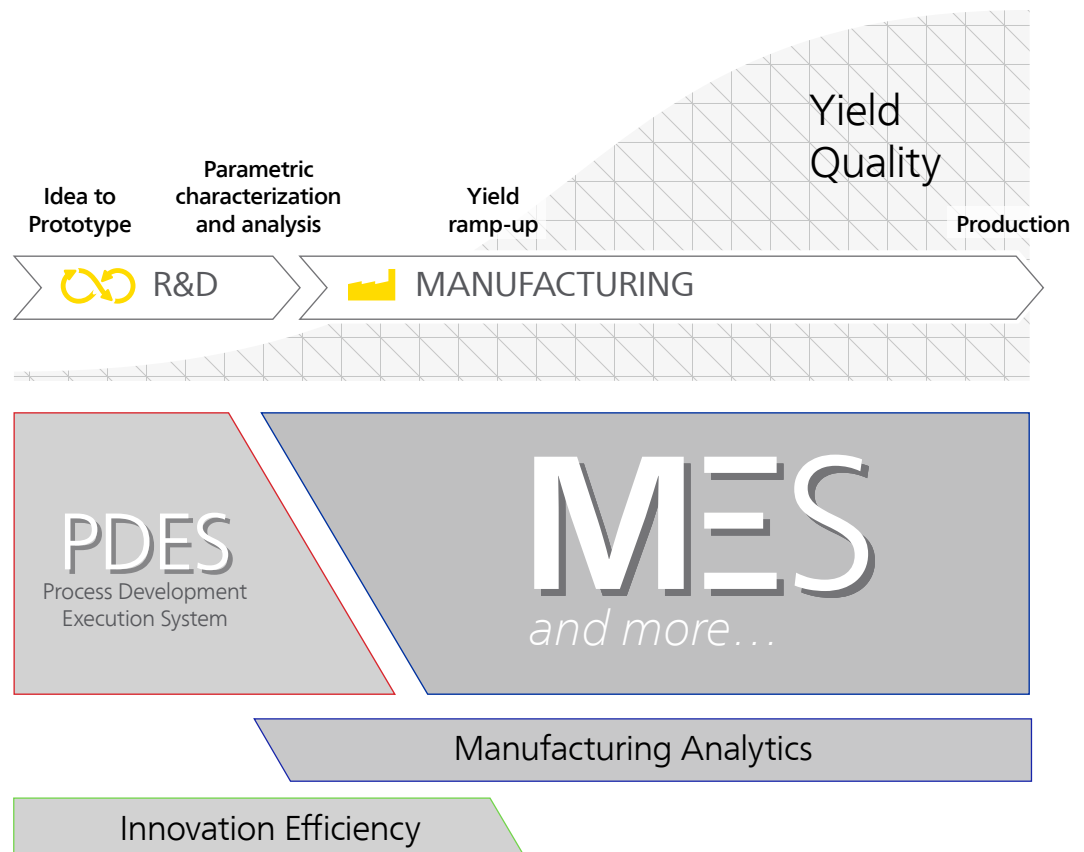
Products & Services for Manufacturing Excellence



Your Benefit:

- Shortening time-to-market
- Condensed ramp-up times
- Abbreviated approval cycles
- Innovation and production traceability

camLine's Service Offering Portfolio – from technology development to manufacturing

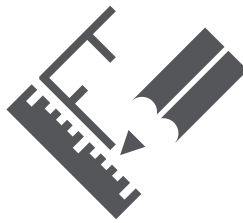




Software Suites

camLine's software solutions complement each other:

- **LineWorks Suite**
Modular high-end solutions tailored to your needs
- **InFrame Synapse**
The MES as all-in-one solution that can grow with demands
- **XperiDesk**
Streamlining technology development
- **Cornerstone**
Application for statistical engineering including Design of Experiments and Manufacturing Analytics



Projects

camLine projects implement solutions tailored to your needs.

- Development projects:
 - Customized solutions
 - Joint development projects
 - Research projects
- Integration Projects:
 - Into existing infrastructure
 - Equipment integration
 - Shop floor integration
 - Production control
 - Quality control
 - Vertical Integration
 - Reporting



Services

Take advantage of camLine's know-how, services, and support:

- To supplement the projective work, camLine will also support you in advisory capacity
- camLine will help you to bring a new camLine solution into service (jump-start service)
- Product trainings / workshops
- Software Maintenance
- Service Level Agreements (Hotline)



www.versuchsplanung.de

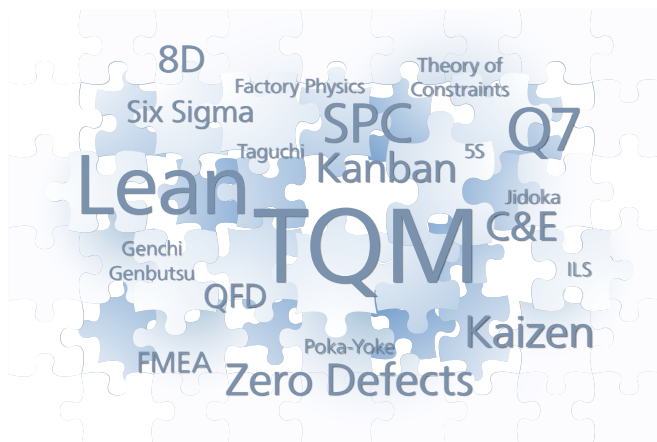
The platform from camLine
for Training and Consulting in
Manufacturing Analytics and
Innovation Efficiency

MES and more

Realizing active operation control for Industry 4.0

Enterprise solutions for smart factories:

- Cultural imprint that has found its place in modern manufacturing in the last decades through business management strategies and quality programs
- The horizontal integration of all value networks is becoming increasingly important, which is why camLine solutions are expanded and offered to this field within the area of quality assurance



'MES and more' benefits for digital manufacturing:

- Easier financing of investments
- Great flexibility and increased efficiency through a smart and compact solution
- High adaptability to market developments
- Lower error rates
- Improved utilization of facilities
- Integration of fully automatic, semi-automatic and manual production systems
- Demand-driven and flexible optimization
- Embedding individual SMEs in greater quality assurance (QA) networks
- QA cooperation of major corporations

camLine Domains



Quality Assurance

Obvious gains of an established quality culture are improved and sustainable response times to enable a faster customer service. With the right quality mindset, your organization will continuously improve and preserve its ability to change. Quality mindset means ambitiously working to prevent known interferences from the past in the future. camLine's quality solutions keep your manufacturing processes under control and ensure to pass customer quality audits.



Production Logistics

Production logistics is there to ensure that each equipment in the shop floor is being fed with the right goods in the right quantity and quality at the right point in time. The issue is not the transportation itself, but to streamline and control the flow of materials and goods through the value adding processes and eliminate non-value adding ones. Finally, traceability is a must to immediately support a product recall within short notice.



Process Integrity

Usually, the registration of salable **products** and manufacturing **equipment** is rather easy. The challenge for manufacturers is to uniquely identify and define entire production **processes** and its changes. Their proof can have far-reaching consequences for the manufacturers with respect to their future competitiveness. The management of process changes and their traceability is associated with many business processes. Providing the correct machine program or recipe guarantees high-quality and minimal cost.



Monitoring and Reporting

Monitoring and reporting provides the right visibility into your organization and locations to make sure you know yourself best, know how to improve yourself tomorrow, and know how you can sustainably secure your success.



Efficiency (OEE)

Efficiency is the capability to use facilities in the most effective way delivering products in the most cost-effective manner possible. The reduced internal costs that result from operational efficiency enable you to achieve higher profit margins or to be more competitive. camLine has solutions at hand that help you understand, mitigate, or even eradicate the underlying issues that affect plant availability or utilization caused by un-planned production stoppages, production slowdowns or sporadic drops in quality.



Equipment Integration

Strictly, equipment integration is a prerequisite to achieve the stated business objectives. camLine provides several strategies to improve the communication with your shop floor. The generic approaches are particularly helpful to connect a heterogeneous system landscape, efficiently.

Are you looking for a system that is based on a modular concept?
Or would you prefer an all-in-one solution?
camLine is the only MES provider who can offer both approaches.



LineWorks

Modules for high-volume manufacturing tailored to your needs



What is the unique LineWorks approach to your requirements?

LineWorks is a suite of independent software modules, which enable you to fulfill your business objectives. Let camLine design the right module bundle for your shop floor. You can benefit from camLine consultation and more than 25 years of experience in the manufacturing IT business.

- Ultimate data rates and data volumes (FAST DATA)
- Manufacturing Data Warehouse
- Kernel for Digital Manufacturing
- Quality Assurance in manufacturing and on the supply chain
- Excellent level of detail for vertical integration

The Core Modules



LineWorks SPACE

Statistical Process Analysis and Control Environment, online process and product data management and analysis, Real-time SPC, Offline-SPC, SPC-Reporting



LineWorks RM

Recipe Management System – central administration of process recipes and control parameters for all production tools



LineWorks PULSE

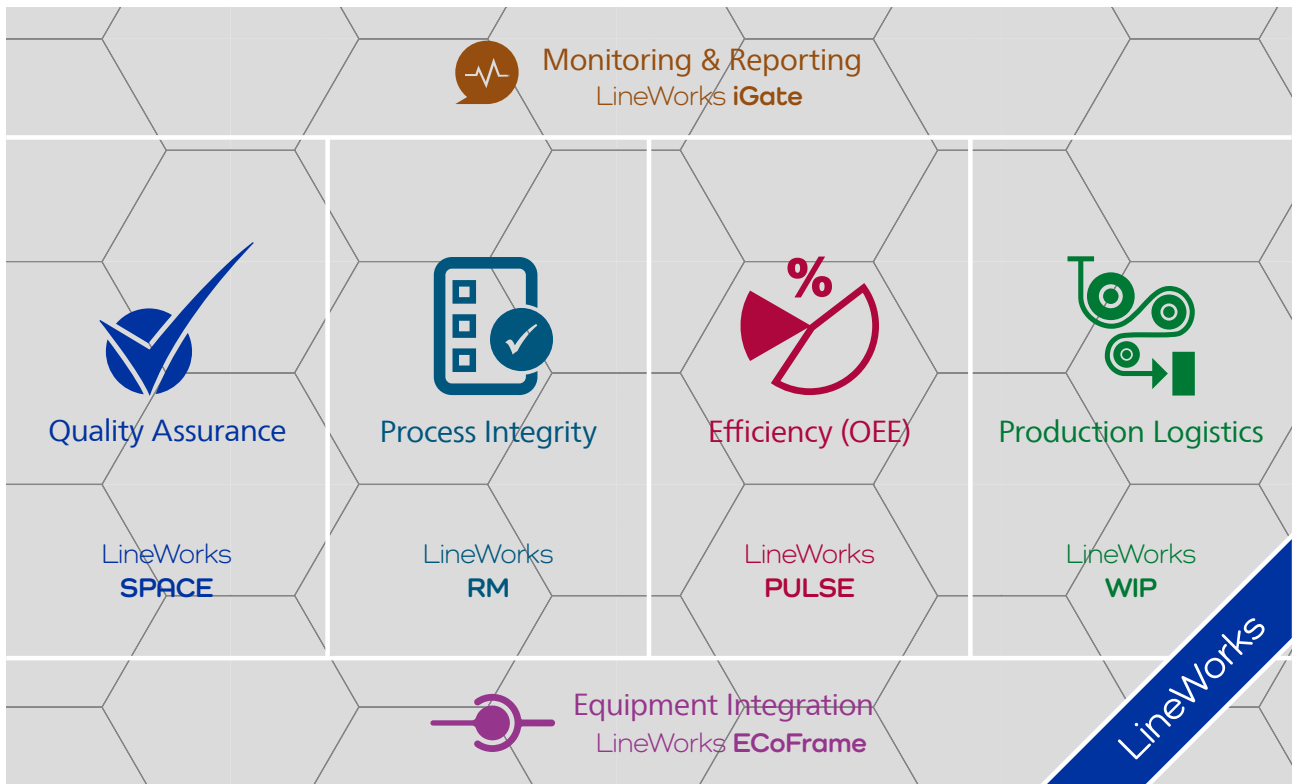
Equipment efficiency monitoring and optimization, recording of any equipment data and fab-wide OEE. Define and execute maintenance to ensure highest uptime.



LineWorks WIP

Work in Process – full transparency through tracking, tracing, and interlocking of fully automated, semi-automated, or manual running fabs. WIP supports, lot, carrier, and serial number tracking for the batch and process industry.

LineWorks Suite



"camLine provided the most flexible MES allowing traceability of all our facilities around the world."

– Continental Automotive

LineWorks SPACE

Advanced Statistical Process Control



Advanced manufacturing quality control

Flagship LineWorks SPACE (Statistical Process Analysis & Control Environment) is a powerful infrastructure solution for advanced SPC that gives you complete control over production quality across all your manufacturing sites.

Relied upon by a wide range of global manufacturers, it has become the de facto standard in the semiconductor industry for integrated statistical process control. It interacts with multiple data sources and processes many thousands of online and offline charts, simultaneously. It ensures you can track all your data by managing it within a centralized database, according to the ISO 9001 standard.

Online-SPC

- Online evaluation of more than 250.000 parameters based on more than 60 rules including Western Electric Rules
- Automated online visualization of control charts
- Support for violations with CA (Corrective Actions), TSG (trouble shooting guides), and alarms

Offline-SPC

- Logical Data Source support with free definable keys
- Flexible control limit calculations with pre-run function
- Powerful search capabilities
- Multi parameter, matching and normalized charts
- Bookmarks
- Versioning and Audit trail
- Multi language support
- Data export to external tools (Cornerstone, qs-STAT, Excel)
- SPACE Dashboard including Web Charts

SPC-Reporting

- Automated cyclic reports: daily/weekly/monthly/quarterly/...
- Standardized report types
- Web reports

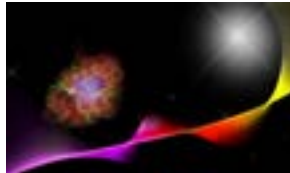
SPACE Chart Plug-ins

LineWorks SPACE is extendible with a series of task related plug-ins, directly at the graphical interface to the users. The SPACE Chart Plug-ins offer advanced analyses features to your engineers and operators on the spot. They allow to get more out of the data pool

that already exists in SPACE. With these plug-ins, you put your workforce in the position to respond quickly. Your team is properly informed and will induce the right countermeasures.



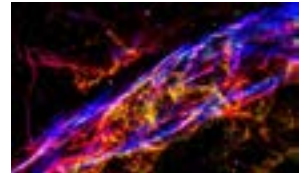
LineWorks SPACE DMP
Device Maps



LineWorks SPACE EWM
E-Test Wafer Maps



LineWorks SPACE PPP
Probability Plot



LineWorks SPACE RAP
Run Analysis



LineWorks SPACE RLC
Raw Line Chart



LineWorks SPACE SCP
Sample Commonality



LineWorks SPACE TGP
Trend Grouping



LineWorks SPACE WIP
Work in Progress

SPACE Add-Ons



eCAP for SPACE
electronic Corrective Action Plans and an automated workflow management to ensure compliance with quality, process, and your individual business regulations



LineWorks SQM/CQM
Supplier Quality Management to reduce Incoming Quality Control (IQC), integrated solution for entire supply chains



LineWorks SDC
provides Statistical Defect Control, an integrated fab-wide solution for detecting defects on (silicon) wafers



LineWorks SPISE++
Web-based user interface that allows you to manually or semi-manually capture missing information for entry into SPC



LineWorks STARGATE
SPC quality reporting of performance KPIs to assess the quality of your SPC activities

LineWorks SQM helps you collaborate more closely with your subcontractors and suppliers at production sites distributed throughout the world. By means of electronic Certificate of Analysis (eCOA), you implement, verify, and continuously improve mandatory quality standards for your entire supply chains.



LineWorks RM

Recipe Management System



LineWorks RM is camLine's recipe management system, an IT infrastructure solution for agile manufacturing to uniquely identify and verify entire production processes.

Particular challenge

Using a Manufacturing Execution System (MES), the registration of salable products and manufacturing equipment is important. However, detecting the identity of all the processes and their changes is a special challenge for manufacturers. For example, contract manufacturing in small batches with high product-mix leads to a significantly growing number of processes. In addition, process specifications may constantly be updated. Due to this diversity and dynam-

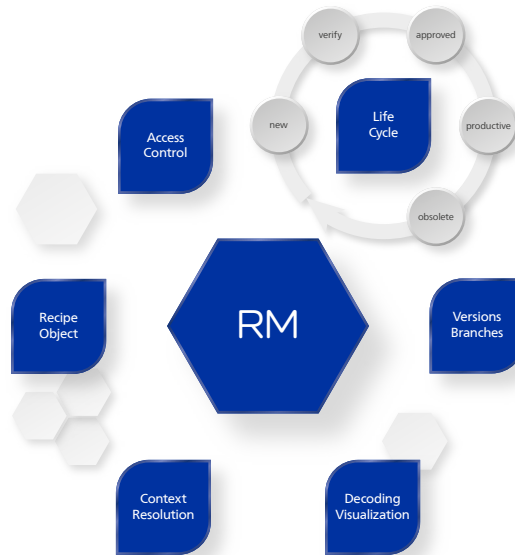
ics, the collection of accurate process flows is a particular challenge for agile manufacturing. Mastering these demands can have far-reaching consequences for the manufacturer's future competitiveness. The management of process changes and their traceability is associated with many business processes. A remarkable potential lies in their efficient rationalization to reduce manufacturing costs.



Process Integrity

"camLine increased our process security while reducing tool setup time."

– Corporate IT Manufacturing Manager, ST Microelectronics



High integrity demands

The recipe management concept established first in the semiconductor industry. There, the productions have to meet high integrity requirements and are confronted with extremely agile conditions for customized products. Nevertheless, the present recipe management system favors the standardized,

industry-independent approach. Systems will be needed to keep the wealth and through Industry 4.0 extremely growing flood of recipes well under control. In digital manufacturing, explicit "product" definitions are supported by verifiable "process" IDs.

Recipe Management System

The recipe management system achieves the desired trade-off: On the one hand, you need to take account of the decision-making authorities of decentralized production units. On the other, you are confronted with the central target definitions to create salable products. The permanent "change"

of process life cycles requires a rather systemic approach comprising structured definitions, steered approvals, and scheduled production launches of all recipes. Herein, the protection of Intellectual Property rights is extremely important.

Protected expertise

Recipes are physical files that are needed by manufacturing equipment (or cyber physical systems) to conduct specific process specifications. Usually, they are kept locally at the equipment. The content of recipes can be seen as protected and compressed know-how of the manufacturers and equipment vendors in the form of comprehensive configuration data or instructions for their equipment. In

production lines, the visualization and realization of recipes widely vary which is a special challenge for the implementation and usage. Operators ask for an improved access to the recipe content. Using a recipe management system, the safe handling of flexible manufacturing processes is standardized and feasible. Learning organizations profit from the know-how driven process development.

LineWorks PULSE

Monitoring of OEE, availability
and utilization of equipment



Monitoring of production equipment

LineWorks PULSE is a solution for integrated shop floor monitoring and reporting. The profitability of process operations are significantly driven by maximizing asset utilization and plant productivity. With PULSE you get the right tool to integrate downtime analyses (DTA) into your everyday business.

PULSE helps you understand, mitigate or even eradicate the underlying issues that affect plant availability or utilization causing unplanned production stoppages, production slow-downs or sporadic drops in quality. According to freely definable equipment models, PULSE collects equipment data, offers trend detection, and supports valuation metrics such as OEE cumulation, Semi E-10 interpretations or RAM analyses. The flexible reporting capabilities are extendable. Use PULSE to initiate continuous improvement programs and to develop best production practices. With PULSE as an integrated fab-wide standard solution, you acquire highest precision in visibility and achieve complete production traceability.

- Improved uptime through faster problem identification and resolution
- Higher overall Return on Investment
- Increased throughput for greater productivity
- Flexible shift definitions



LineWorks OPM

Online Process Monitor, provides line supervisors and operators an actual insight into the current manufacturing status



LineWorks MaiMa

Maintenance Manager, central management to maintain the shop floor on a regular basis in order to avoid unplanned downtimes



Efficiency (OEE)

LineWorks WIP

Key to reliable production logistics



Production execution

LineWorks WIP is your tool to guarantee, actively control, and fully document precise job (orders) and material flow execution throughout the enterprise manufacturing process. It delivers a wide range of perspectives for different audiences (managers, engineers, operators).

In addition to stationary views on single processes, LineWorks WIP offers the documenting transportation view on flowing material. LineWorks WIP supports multiple levels of aggregation, from total orders (bird's-eye view) right down to individual process information.

- High flexibility in workflow design
- Interactive control of manufacturing processes and material flows
- Documented material movements
- Ensuring compliance requirements
- Handling of identifiable and unidentifiable units
- Compact solution
- Automated tracking of workflows
- Elimination of waste (lean), e.g. downtime
- Connection to Production Planning (PPS) and Enterprise Resource Planning (ERP)



LineWorks PMDA

Process Main Data Administration, manages your product definitions, process steps, process plans, parts lists, and loss and failure reasons



LineWorks MaMa

Material Management, tracking and monitoring of materials that is currently in stock, raw, semi, and finished goods or durables and consumables



LineWorks CarMa

Carrier Management, flexible administration and tracing of all kinds of carriers like FOUF, SMIF pods, cassettes, boxes, and the contained material



LineWorks MPM

Master Process Monitor provides operators and engineers with a real-time overview of their production results



Further LineWorks Modules



LineWorks mDICE

Independent Manufacturing Data Warehouse

Using an independent Manufacturing Data Warehouse in conjunction with your MES, you will get the power to enrich your existing manufacturing environment with interactive analyses and sustainability reports. mDICE comes with a database that is really designed to hold a very large amount of data. It allows an exceptionally fast data access.

Availability

- Create manufacturing standards for traceability, performance, and quality reporting
- Integrate data of your manufacturing IT
- Profit from high-performance reporting
- Trend & compare of your KPIs
- KPIs by products, processes, locations
- Ability to process multiple years' worth of data

Technology

- Independent from your OLTP-System
- No impact on production performance
- Enhanced traceability archiving
- Designed to hold over ten Terabytes of data
- Lower capital costs through use of commodity servers
- No additional storage required due to stable size of MES database



LineWorks iGate

Framework for live data reporting

LineWorks iGate allows IT specialists to establish a repository of dynamic web reports from live data. In a standard browser the reports provide the end users with an interactive graphical user interface to trigger high-level queries and assemble dynamic reports that consist mainly of linked tables, charts, and lists. The report development is based on XML templates and does not require programming efforts.

- Publish by configuration
- Provide reports just via configuration
- Define a report layout without being a WEB specialist
- Configuration based on XML-Files
- Fast integration of existing data sources
- Local customer databases
- Application development like WebUI
- Support for user authorization together with LineWorks UA





LineWorks ECoFrame

Efficient way to connect to equipment

LineWorks ECoFrame (Equipment Connection Framework) offers an efficient way to connect to equipment including equipment data collection, data routing, and remote equipment control with respect to the existing capabilities of the equipment interface.

The communication guarantees maximum data quality and detail. ECoFrame supports process data, alarms or events to be routed to other LineWorks modules and / or third-party solutions. The interface of ECoFrame supports international communication standard protocols, e.g. SECS / GEM, PROFIBUS, OPC.

- Cost reduction for shop-floor integration
- Administration instead of programming
- Integrated interfaces to MES modules
- Integrated process data collection (PDC)
- Integrated business rules according to the SECS / GEM-SEMI standards
- Other communication protocols are supported



LineWorks UA

Smart User Administration

LineWorks UA administers the permissions of individual users in LineWorks products or other applications, while distinguishing between users, user groups (roles) and divisions (areas of responsibilities).

Each role defines a certain permissions profile which consists of concrete permissions for handling objects. These range from guest status which only allows chart views, to expert status that permits report generation



Infrastructure



LineWorks NFM

Notification Manager

LineWorks NFM is a module to provide management and runtime activity for sending notifications to groups of people. The notifications are typically e-mail messages which are sent through the standard Simple Mail Transfer Protocol (SMTP) to the recipients' e-mail addresses, but also they can be SMS or Pager Messages.

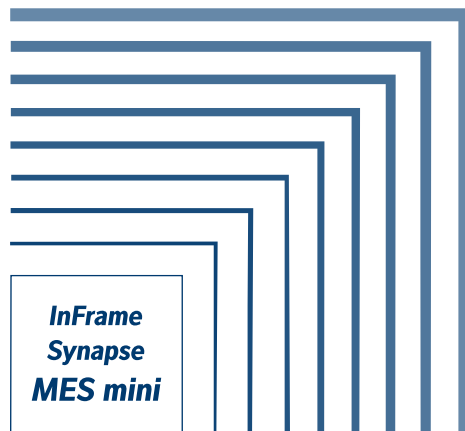
InFrameSynapse

*The compact MES for
small and medium sized enterprises*



Highest manufacturing performance together with outstanding quality and fastest innovations play a central role for manufacturers.

With Synapse camLine offers a product family that copes with these challenges in an ideal way by offering a powerful software platform to completely manage, monitor, integrate, and control high-tech production lines and equipment for small and medium enterprises (SME's).



InFrame Synapse Equipment Connector

Shop Floor

Your benefits:

Fastest time to production ramp-up

- Optimization of line logistics and equipment interfaces
- Out-of-the-box configurable equipment interfaces

Best class yield

- Comprehensive recording of process data
- Powerful analysis and diagnosis tools to increase quality

Guaranteed compliance

- Complete tracking and tracing
- Highest availability and reliability

Lowest operation cost

- Optimized cycle times and throughput
- Minimized work in progress (WIP)
- Real-time monitoring and control

InFrame Synapse MES

Manufacturing Execution System for high-tech fabrication sites

- Manufacturing Execution System (MES)
- Cost-effective solution
- Process oriented organization
- Rapid integration
- Direct entry into Tracking & Tracing

InFrame Synapse MES mini

Effective entry into IT-based manufacturing

- Manufacturing Execution System (MES) for SMEs
- Cost-effective solution
- Process oriented organization
- Rapid integration
- Direct entry into Tracking & Tracing
- Further expansion is possible according to your future growth

InFrame Synapse Equipment Connector

Powerful interface for easy to use equipment integration

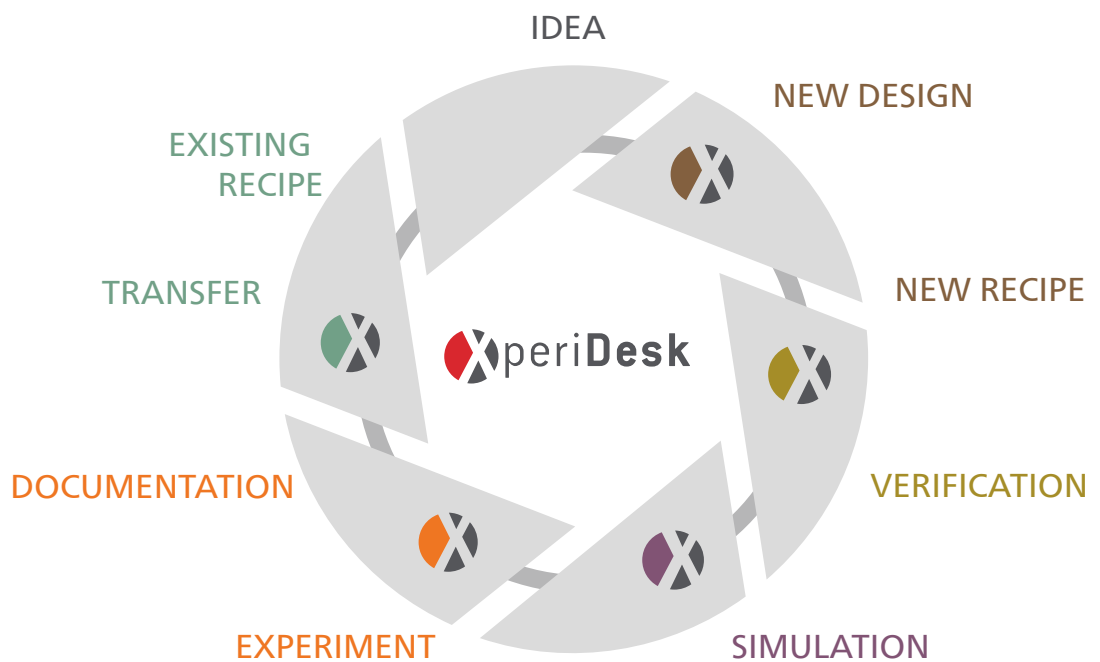
- Compliance with SEMI SECS / GEM 200mm and 300mm standards, as well as SEMI-PV02
- Highly flexible process data recording
- All major PLC products
- PCs with industrial applications
- Optional MES interfaces

XperiDesk

Streamlining Technology Development



The XperiDesk Suite applies the principles of Enterprise Information Management (EIM) and Manufacturing Intelligence (MI) to the field of R&D for high-tech manufacturing processes. It can be considered to be a special blend of bottom-up Product Lifecycle Management (PLM) and R&D oriented Manufacturing Execution System (MES). It aims to establish a seamless connection between R&D and Manufacturing.



XperiCipe XperiFication XperiSim XperiLink XperiSIC



Your benefits:

XperiDesk can expedite your R&D with flexible software including:

- Next generation recipe and DoE management
- Virtual manufacturing management
- Automated data collection from various sources
- Experimental data management, analysis and extraction

XperiDesk provides a faster and more cost-effective development through structuring and optimizing the complete R&D workflow.:

- Focusing engineers on value added / creative tasks (SMART DATA)
- 20 % productivity increase of engineering teams
- 20 % less experiments conducted
- 25 % increase in IP reuse
- Approx. 5 % revenue uplift

Cornerstone

Data analysis software designed for engineers



Gives you the power to optimize processes and uncover correlations in your data. Contribute with technical methods to the success of your business, in manufacturing, R&D, quality assurance, or others.

Cornerstone combines powerful state-of-the-art data analysis techniques with a highly intuitive user interface. It is especially designed for the level of typical engineering tasks. Work with Cornerstone to simplify the identification of potential process cost savings!

An ingenious set of smart statistical analysis tools gives Cornerstone its unmatched efficiency. Enjoy this complete environment for exploratory data analysis (EDA), model building, and experimental design (DoE)!

Enhanced Cornerstone (ECS):

The Cornerstone (CS) plug-in enhances and accelerates data analyses with Cornerstone and allows to perform additional tasks not available in standard Cornerstone. ECS is realized in CEL (Cornerstone Extension Language) and can be adapted to further functions and tasks. ECS follows Cornerstone principles like continuity and compactness to keep track of changing data sources as long as this is possible in CEL. With a few mouse clicks hundreds of graphs and other analyses can be created in ECS and are presented in a very compact and instructive way by applying reports and matrixgraphs.

Your Benefits:

Consistent

Cornerstone preserves all links between data with their sources. Consistently, the same holds for all graphs and analyses objects based on these data. This allows a direct update of the whole Workmap in case of changing data or even switching to different data sources of the same structure. This concept will handle even huge data sets. Your results are always up-to-date with no additional programming or scripting required.

Practical

Cornerstone gives you the flexibility to view your data in multiple ways and at different presentation levels. With interactive graphical tools you quickly identify dependencies and correlations in your data and verify your findings with formal statistical methods such as significance tests and confidence intervals. You create meaningful reports inside Cornerstone. Alternatively, you can share your results with other software via the clipboard or common file formats.

Smart

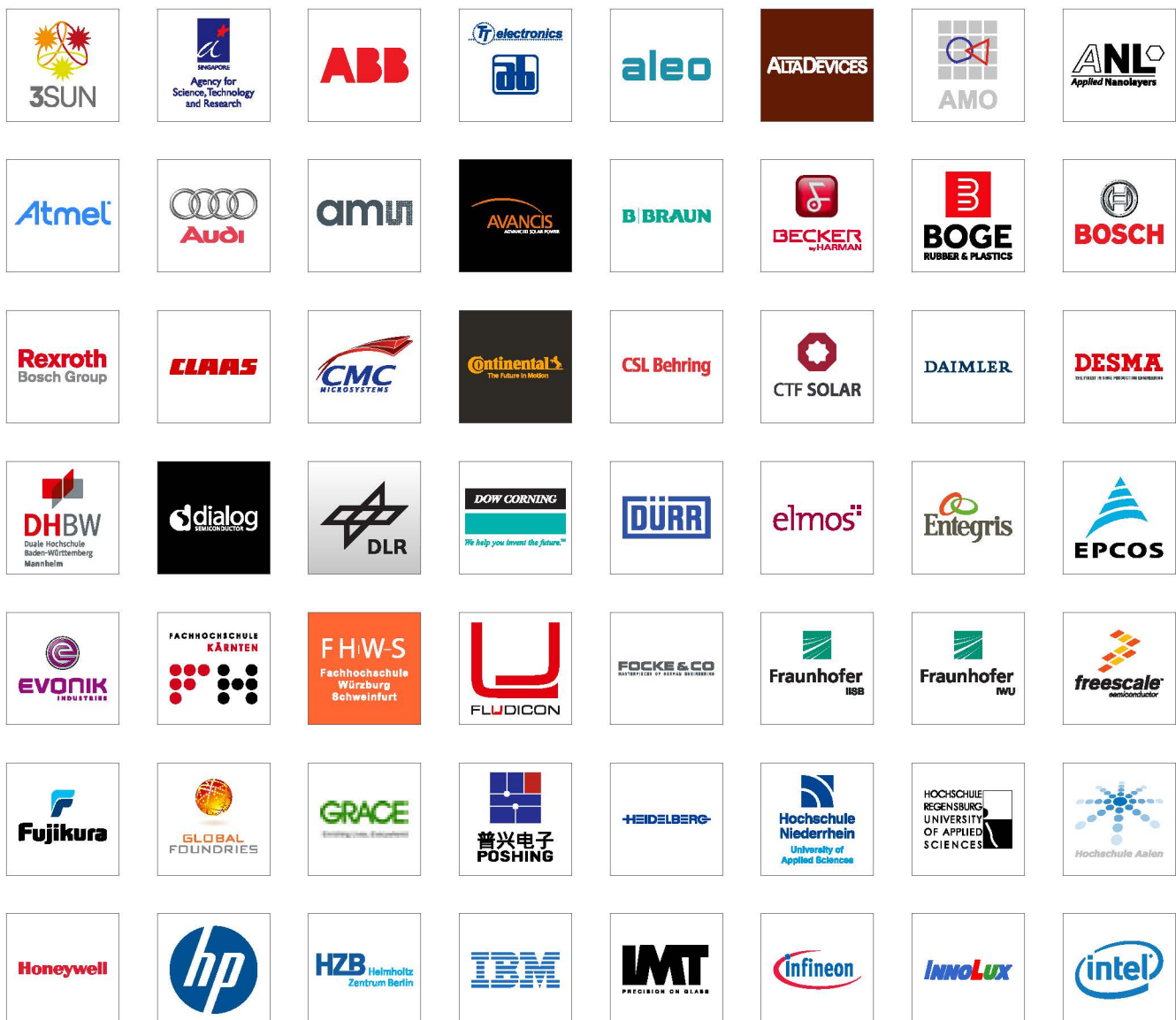
Profit from Cornerstone's efficiency second to none! With its smart set of generic tools, you will have available statistical methods and graph types that satisfy the vast majority of engineers' and scientists' needs. You can generate graphical outputs directly in presentation quality. The included manuals are truly designed as textbooks which show exactly how to get most out of Cornerstone. This ensures maximum user efficiency and minimum training time.

Focus on DoE

Cornerstone has an extra focus on designed experiments (DoE). The DoE implementation of Cornerstone is straight. It largely dispenses with difficult to understand phrases of statistics. So to speak this "re-engineering" of statistics allows a much tighter approach with a streamlined user interface. Aspects of experimental design that are irrelevant to engineering are omitted in favor of a more user-friendly guidance.

References

Customer list (a selection)





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