



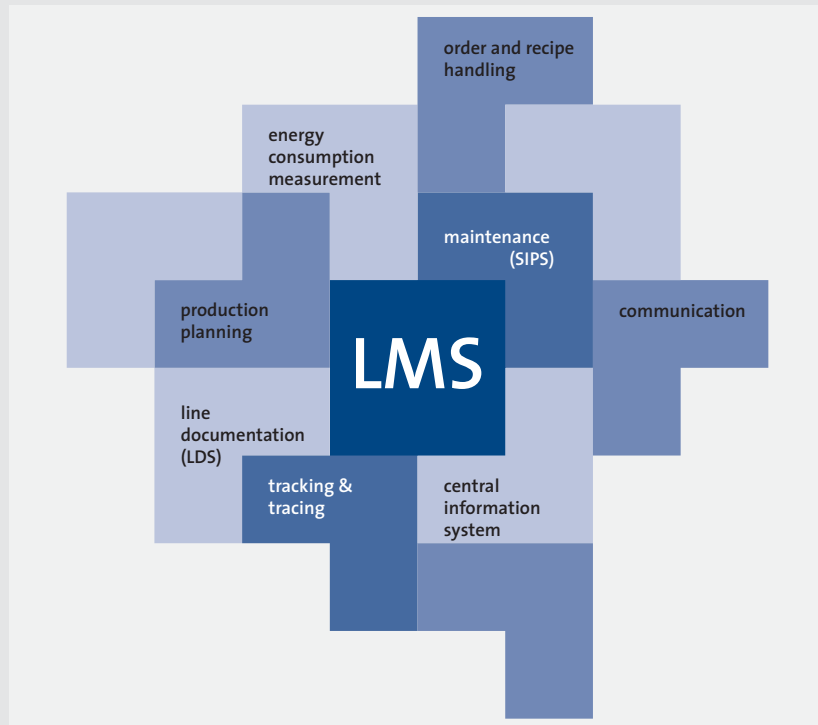
KRONES Line Management
Line Management in filling and packaging
departments with IT solutions

1. Initial situation

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Enjoyment, wellness and convenience – these characteristics aptly describe consumers' expectations on consumer goods. The beverage industry picks up these trends and continually introduces new products to the market.

However, new trends in a branch always have effects on filling and packaging operations. Sensitive beverages, new packaging materials or forms require new technologies and a high degree of machine flexibility. Frequent changes of articles with differing packaging sizes and labels, smaller batches as well as orders that are altered on short notice or supplemented result from this variety of products and force a rise in manufacturing costs. Under these conditions it is only possible to achieve cost-effective manufacturing if the costs are counterbalanced by the best possible plant availability and the best possible degree of utilisation.



Costs are produced primarily by the manpower needed to operate the line and the number of shifts as well as the costs accrued due to maintenance and repair work. However, indirect costs that are caused by factors such as runtimes and the succession of orders, necessary set-up and cleaning times or downtimes due to disturbances also represent substantial contributions to overall costs. Yet a great deal of optimisation potential is present in these influential factors.

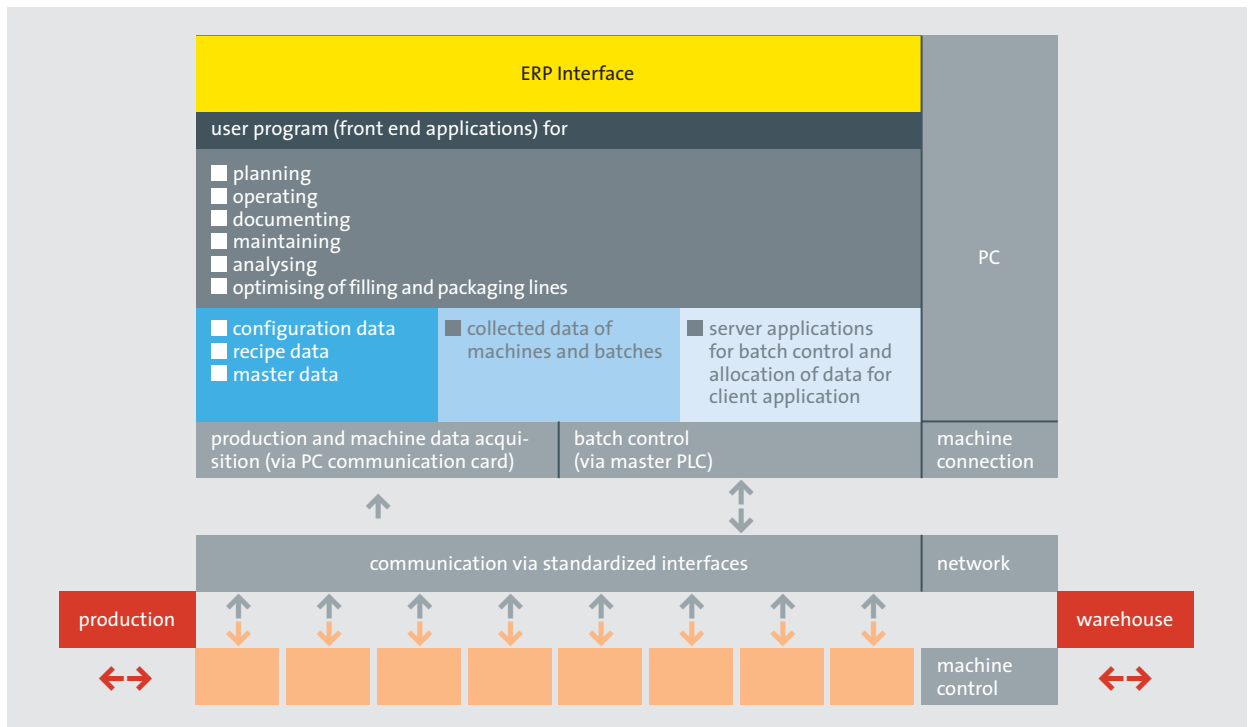
KRONES is now offering appropriate software modules that were developed specifically for the management of filling and packaging lines. This Line Management assists the operator of a plant in his planning, operation, documentation, analysis, optimisation and maintenance of the lines.

With its Line Management, KRONES is providing the beverage industry with an instrument consisting of various modules that enable control and regulation of the entire range of filling and packaging. Besides the complete Line Management package, individual modules can be installed, depending upon the customer's requirements. It is the task of the system to increase the productivity of a plant, to optimise its life cycle and ultimately to reduce the costs of each item produced.

2. Structure

The Line Management System from KRONES consists of a core of standard components which can be supplemented by a series of modules – as is evident from the following diagram structure.

Structure krones
Line Management



The solutions for Line Management result from the interaction among various functional levels:

The basic functions of the filling and packaging line are determined by the individual machines such as the fillers, labelling machines, palletisers, conveyors, special auxiliary plants such as CIP and flash pasteuriser and components such as printers, scanners and inspectors.

In order to employ superimposed functions of information technology it must be possible to exchange information bi-directionally among the line participants, but also with the superimposed systems. This communication is effected via a network connecting the individual components; usually by means of an Ethernet network that processes various protocols – increasingly TCP/IP. In order to assure problem-free communication, standardised interfaces are used on the machine side that permit integration of the superimposed IT modules in the filling line.

Important and decisive as well for problem-free communication is the data and information exchange with the neighbouring sections of the manufacturing process: on the one hand with the process control system in the production department, to exchange information about the product being filled, the availability and the source tanks, on the other with the material flow computer or with the warehouse management computer.

The coupling of the Line Management System is effected – depending on the modules installed – via the operating and machine data acquisition system that is connected to the network by means of a special PC communication board and, if necessary, by means of the batch control system that runs in the master control system. The batch control system coordinates the individual aggregates of the filling line. In this manner, batch oriented filling and packaging procedures are carried out on the basis of production recipes and filling orders.

Advantages that result from batch oriented production:

- central order specification for all machines
- specification of the required materials
- batch oriented protocols
- traceability
- “flying change” of orders, i. e. the previous order is still being processed at the palletising machine, while the next order is already active at the filler

The configuration data of the line and of the machines is stored at a central location. Besides this data, production recipes along with their processing sequences and their parameters are also to be found there. General master data such as materials, article compositions, but also system data such as user names and passwords complete the basic information.

The data acquired from the filling and packaging lines is stored in the Line Management database. Most of the information is based on the collected machine and operating data of the individual line components. When the order control system is implemented, the batch data from the confirmation reports of the processed production steps with their reference and actual values is used.

Redundant server applications supply the data for the establishment of the parameters or for the batch control of the individual machines. In return, the data for the line visualisation, for production reports and analyses, for quality management as well as for current production and order planning is supplied. Also available is the necessary online data for maintenance planning.

Front Ends:

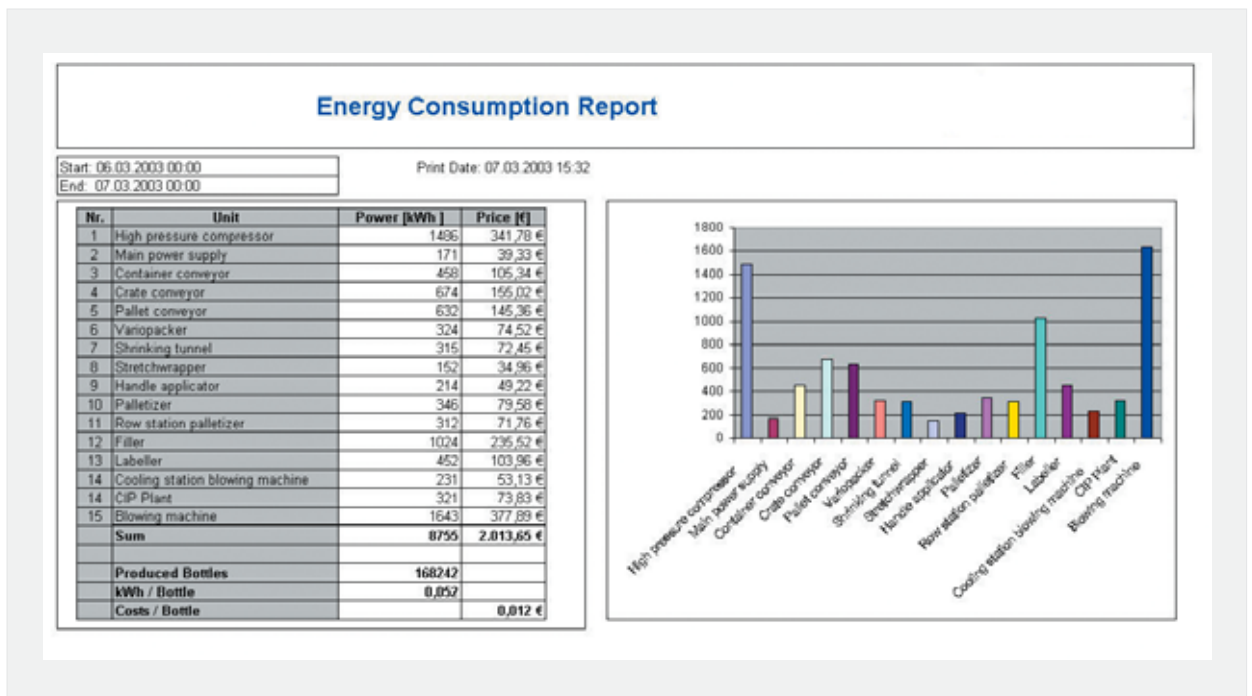
- for production planners: an easy to use order and recipe system
- for plant operators: a detailed plant and machine synopsis with machine statuses, messages and important production figures
- for service personnel: disturbance reports and maintenance orders
- for quality assurance: the required measured values and recordings
- for management: selected and compressed figures, the so-called key performance indicators

The final part of the functional level is formed by the interfaces to superimposed systems of the company EDP. These are generally interfaces to an ERP system including the acceptance of production orders and the reporting of the corresponding production and consumption figures as well as maintenance and quality information.

3. Modules

Line Documentation System (LDS)
 The Line Documentation System is responsible for the documentation and analysis of filling and packaging processes. The acquisition of operating and machine data forms the basis for the analysis of process and product quality. The process and weak point analysis provides a fast overview of the manufacturing process, the product and the availability of the plant.

Measurement of Consumption Values



- The LDS supplies reports on:**
- operating downtimes
 - degrees of efficiency
 - plant utilisation
 - consumption values
 - pressures
 - temperatures
 - batches

The reports are freely configurable and simple to generate. The standard front end is Excel. A clear visualisation surface provides the user with a fast overview of the current statuses of the individual aggregates and of the entire plant.

Desired information is sought and found simply and easily. An optionally available LED largescale display facilitates the registration, monitoring and control of production values. Varying production parameters are apparent at a glance.

Measurement of Consumption Values

Knowledge about the energy consumption of a production plant is among the most important factors in determining the profitability of the manufacturing costs. Using the consumption values analysis from KRONES it is possible to quickly detect the greatest energy consumers. Measured and recorded for all important aggregates – beginning with the machines of the plant,

up to the high pressure compressors and main power supply – are the following: voltage, current, effective output, reactive output, apparent output and power factor as well as, above all, the energy consumption in kWh per measured time unit. Peak loads as well as energy costs per produced item can be easily determined in Excel evaluations.

Order and Recipe Control

Order and Recipe Control within the KRONES Line Management System enables a central control station function for filling and packaging lines. The filling line is no longer regarded as a series of individual, isolated machines with a continuous process but as a complete plant with production batches. The order system with its interfaces to the machines of the line makes it possible to manage the line by means of orders and to apply a several stage method of batch processing to the individual machines of the line.

Connection to a superimposed host system for the purpose of passing on the order and delivering replies from the line is rendered possible. In this manner it is possible to integrate the filling lines in the system landscape of the company EDP (ERP). Filling orders are divided up into machine orders and distributed to the respective machines along with product recipes and the required materials; they are displayed on the machines and processed there.

Tracking and Tracing

Gap-free batch tracing from the production department through shipping and up to the customer's site is enabled by the Tracking and Tracing tool. During the filling and packaging operations the module records data from the individual machines such as fillers, labelling machines, packers and palletisers.

Thus it is possible to trace the following information for a filling batch:

- Which product was filled from which product batch?
- Which bottling, sealing or labelling batch was used?
- At what time did the batch run at which machine?
- On what pallet was the batch stacked?

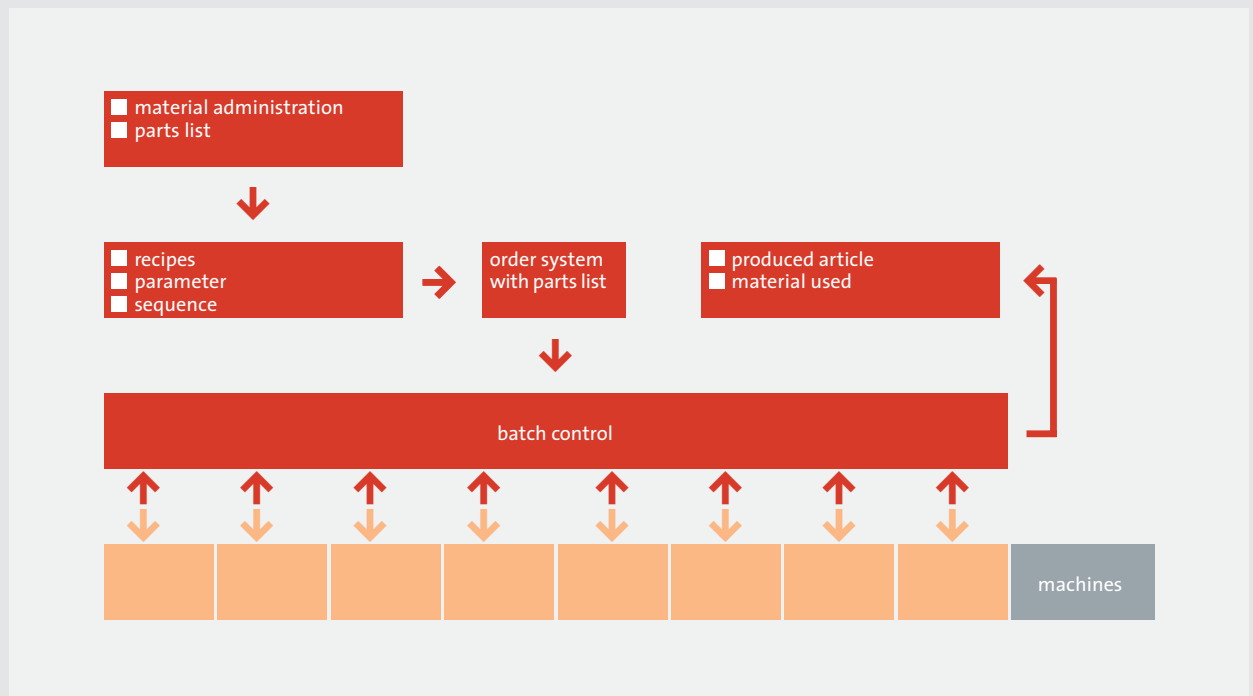
In combination with the recorded machine, process and quality data, complete traceability in the filling area results.

Maintenance Planning

Efficient maintenance planning is available to the plant operator with the aid of the tool SIPS (KRONES Intelligent Plant Maintenance System). By means of the preventive maintenance mechanism of the SIPS, breakdown times of plant components can be avoided or at least reduced to a minimum and maintenance intervals implemented according to plan. The solution that can be configured individually by the plant operator contains triggering devices for particular maintenance work such as operating hours, number of switching cycles or calendar related values. Besides work orders and work instructions, reports and messages can also be generated and displayed with SIPS. Acknowledge messages concerning maintenance or repair orders are recorded in the system and serve as the data-based foundation for the development of new maintenance strategies.

The data from SIPS can also be transmitted to a mobile pocket PC. Thus the necessary information is then available on site. Moreover, spare parts can be managed by means of a small parts warehouse on site.

Order and Recipe Control





Tracking & Tracing enables complete traceability in the filling department

Production Planning

The Production Planning module supports the optimum control of the processes involved in filling and packaging. With the aid of this planning tool it is possible to plan and visualise production plans taking into consideration the required set-up times, the degrees of efficiency of the lines and line outputs for an arbitrary time period. This interactive software solution enables the assigning of orders / batches for filling and packaging via drag & drop to the respective lines. Fast inspection of orders already planned as well as of orders to be planned in the future is hereby assured. The module supports the simultaneous processing of alternative plans. And in addition to manual planning, the module also enables the automatic generation of a production plan.

Plant Communication

The exchange of data forms the basis of information technology. Line Management as the central information platform hereby utilises various media and interfaces. The backbone of a regulated information flow is network technology. This is based on Ethernet and TCP/IP at the machine level, LMS with database application

and ERP as well as the preceding and following production areas, whereby mobile data acquisition by means of PDA or wireless LAN is being employed ever more frequently.

To achieve swift and transparent coupling of the machine technology to the Line Management System, there are standardised interfaces to the machines for the exchange of data including disturbance data, operating data, product data, measured values, maintenance information, order data as well as material data. Connection to the company EDP department is effected via the ERP interface that uses a flat file or XML mechanism and thereby supports the B2MML standard. Order data, produced items, materials used, maintenance data and material master data are thereby exchanged.

In order to enable synchronisation of production orders and material flows covering all areas and to establish thereby the basis for product and batch tracing, a connection exists to the preceding and following departments (production and warehouse). The corresponding, relevant data is transmitted here. From the production area, information on the product, batch number and source tank is transmitted to synchronise product transfer to the filler; the data of the palletised article on the other hand is transmitted to the material flow computer of the warehouse.

Central Information System

The Central Information System from KRONES is a superimposed information and reporting medium that summarises, stores, processes and makes available to the plant operator operating data, machine data, process data, batch data and other relevant data from other applications. Thus it is possible to link very different data sources throughout the company to one another to generate from them significant figures, calculations and product analyses. The output of this information is effected in modern web reporting fashion. Therefore, the data is available for presentation accordingly at any location of the plant. Additional modules are in preparation.



4. Advantages

With KRONES Line Management System, information technology advances into a new dimension in the realm of filling and packaging. The tools of the Line Management System assist in fulfilling the requirements for fast product changeover, short set-up times and uniform quality. Moreover, the Line Management System also contributes decisively to optimising life cycle costs—a central topic in every beverage manufacturing plant.

Filling and packaging become more flexible and economically efficient due to:

- command of fast product changeover
- optimum utilisation of resources
- optimum order sequences
- flexible order processing
- transparency of the process based on significant evaluation tools
- planning safety
- connection to a company wide goods management system
- minimisation of weak points
- high availability due to preventive maintenance
- recording of life cycle costs