

Industrial^{IT}: Production Information Management for Mineral Processing Industries

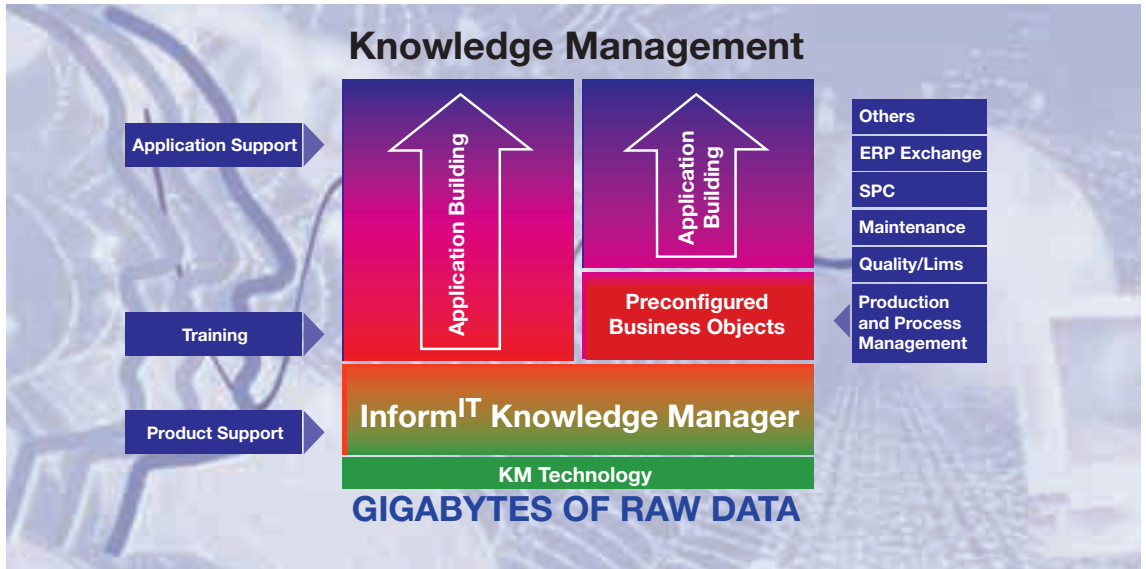
Inform^{IT} Knowledge Manager



ABB

Inform^{IT} Knowledge Manager

All production knowledge at your fingertips. You need easy access to timely, accurate, reliable information in order to enhance enterprise-wide productivity.



Effective production management

If you have the specific information you need at the right time and the right place in the right format, your decisions will be more goal oriented, and you will be able to optimize processes and increase productivity. With Knowledge Manager part of ABB's Inform^{IT} application suite you have the solution and advanced tools you need to facilitate the collection, organization and distribution of production, process and quality information throughout the plant organization.



Four tiers: maximum availability and comfort

Inform^{IT} Knowledge Manager is built on the new generation of KM Technology. It offers open client/server Intranet solutions for the acquisition and distribution of plant information, and is based on industry standards, ranging from hardware and operating system (Windows 2000) to database management (RDBMS) and desktop functions using the familiar Windows environment and Internet standards such as HTML and HTTP. The software has been developed to support the component structure, and its architecture is based on a four-tier model: Thin Client, Application Server, Database Server, and Data Collector.



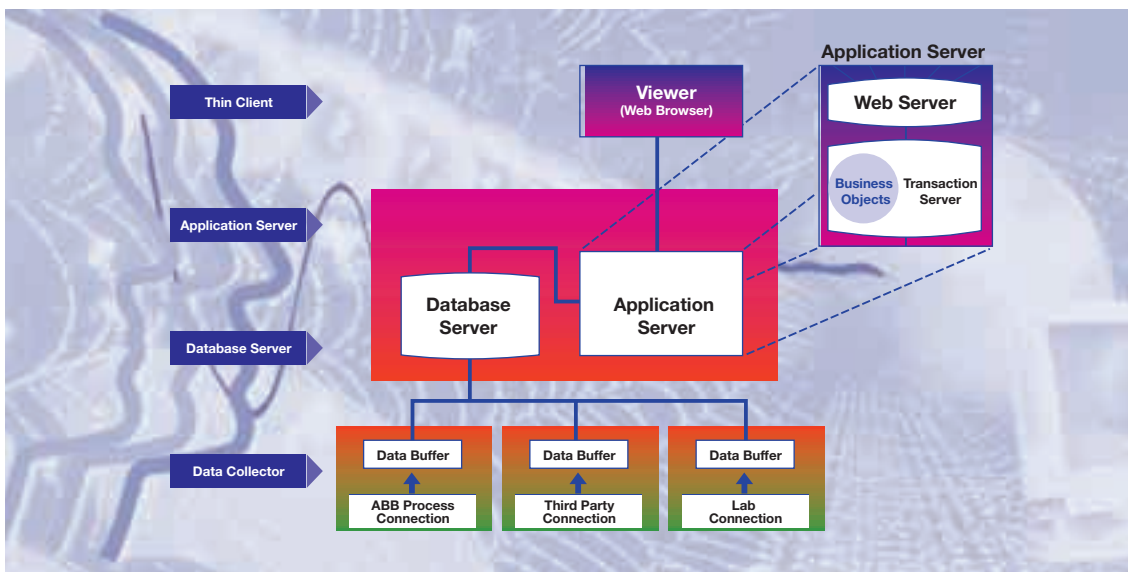
ABB chose an innovative thin client approach with the goal of making Knowledge Manager installation, operation and maintenance as simple as



possible. The only software that needs to be installed on client computers is a Web Browser. Using this, it is possible to analyze and review the collected information from various perspectives, generate focused reports to aid management with informed decision-making, and discover new opportunities by exploring historical process and quality information. Since ABB is well aware that each customer places his own special demands on data evaluation and the acquisition of information, **Inform^{IT} Knowledge Manager** provides a range of easy-to-use configuration tools.

- **Viewer** to navigate in an Intranet, to select and view documents, reports and graphics, or even to make manual entries using standard Web Browser.
- **Configurator** to configure process tags, database logs and trends and reports using simple drag & drop editing.
- **Template Builder** to create templates for Intranet documents, reports or graphics from the library of pre-built business objects, using drag and drop editing.

The **Application Server**, which is where the business logic is located, provides services such as data integration and consolidation, presentation of information, user authorization and client access management. The repository for the historical information and process-based knowledge is the



Inform^{IT} Knowledge Manager offers Intranet solutions that are tailored to meet your specific requirements.

Data Warehouse managed by **Database Server** based on ABB's Enterprise Historian. The **Data Collector** gathers live data from different sources and stores it in the local data buffer. It uses ABB's Connections to communicate with ABB and other vendor's control and PLC systems, laboratory analyzers and ERP systems.

Saving you money

Inform^{IT} Knowledge Manager's flat learning curve saves you instruction and implementation time. Research into information systems technology, software programming or interfacing is unnecessary. For example, the industry-specific application modules are available as set of pre-configured business objects, enabling you to capitalize on the expertise of others who have already developed equivalent solutions. Quite simply, you enter the learning curve at a much higher level. The time needed to produce a working solution is much shorter, involving less risk and less lead-time before on-site knowledge management begins. Of course, you decide how much of the solution development you wish to do in-house and how much assistance you would like ABB to provide.

Modular design

Since Knowledge Manager is a modular solution, it can be adapted to meet each company's specific

requirements, and can be expanded to incorporate up to several hundred users in order to keep pace with growing demand. The basic system comprises all functions and components needed for communication and data acquisition, industry specific data ware housing (RDBMS) and focused information presentation. The basic system can be expanded by a variety of pre-configured business objects in order to keep pace with specific requirements.

There are standard packages for:

- Production and process management
- Quality management/LIMS
- Maintenance support
- Personal assistant
- Statistical process control
- Excel add-in
- Material Balancing

Benefits
• Increased production efficiency through integrated process, production and quality information and documentation as well as accurate detection of critical process variables.
• Improved decision-making through fast access to relevant information from users' PC's.
• Reduced cost in the fields of engineering, configuration, maintenance and training
• Leading edge IT architecture with high flexibility and complete integration of plant information.
• Thin client approach ensures simplicity of installation, operation and maintenance.

Basic Software and Toolkit

The basic software and toolkit allow the user to immediately start using the features of Inform^{IT} Knowledge Manager to the full extent.

“From the cutting edge of web based technology... customized to your industry... **ready to use!**”

Industry specific preconfigured functionality allows the user to:

- view plant mimics
- monitor key operating and process variables
- trend variables and show statistics
- produce operation reports

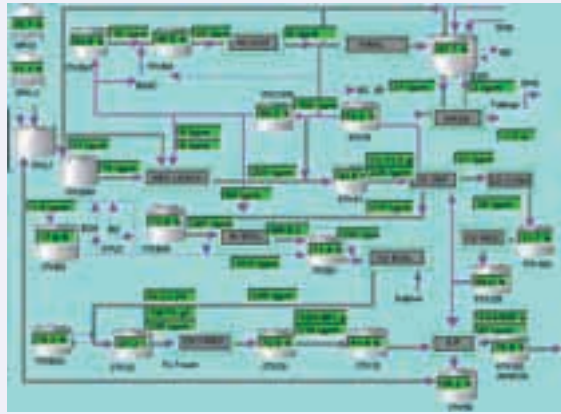
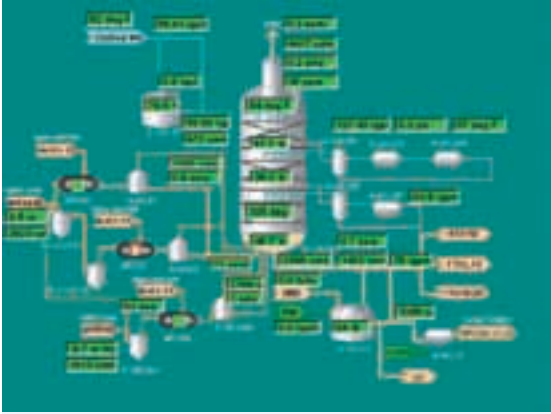
ABB chose an innovative thin client approach. This reduces the Inform^{IT} Knowledge Manager client installation, operation and maintenance to no more than your favourite Web Browser. HTTP technology takes care of the rest.



Trend in rivergraph view, showing the standard deviation on the variables

Basic Software

- True web-based
- Process point historian
- Operation reporting
- Charts & trending
- Process visualization
- Remote and distributed data collection
- Store & forward data collection
- 3rd party historian connections
- Manual data entry
- Backup and archiving
- User authorization & administration
- System status & diagnostics
- System maintenance and adaptation
- Tag browser
- Time-series data handling
- Transactional data handling
- Data quality marking
- Signal value reports
- Data correction
- Audit log
- Print and e-mail scheduler
- Pre-configured and ad-hoc reduction types
- Statistical functions
- RDBMS based
- Process controller connections
- Laboratory equipment connections
- Business system connections
- Dispatch and G/R administration system connections
- Business data warehouse connections
- Robustness for continuous operation
- Scalable
- Modular



Real-time decisions make the efficient supply chain. Server hardware performance and storage space is the only restriction for the number and the lifetime of data. Data can easily be kept online for years without archiving. Raw data is filtered and processed to meaningful process and production management information. Flexibility is a key element: increased production efficiency and improved decision making are tied specifically to your plant. The Knowledge Manager Toolkit allows the user to create and customize displays, report templates, reports, trends manual entry forms, survey sheets, etc. and make them

available for client users, using a graphical and menu driven ALL IN ONE toolkit. Run time viewing of configurations is a standard feature. Included is a comprehensive library of predefined components with presentation graphics, reports and manual entries. Business objects for user authorization, user management, status monitoring, data retrieval, data processing, configuration handling, consistency checking and enforcement, etc. are standard. The Knowledge Manager Toolkit embeds various scripting tools for additional complex processing, treatment of data and advanced templates and reports.

Developer Toolkit

- Full system configuration management
- Fill-in-the-blanks
- Drag & drop
- Copy & paste
- Toolbox with pre-configured elements
- Only basic computer skills required
- Signal definitions
- Log definitions
- Template and report configurations
- Custom calculations
- Custom plant explorer structure
- Data pre-processing
- Material definitions
- Analysis plan definitions
- User management and authorization
- Status monitoring
- On-line help

Production and Process Management module



Production and process managers have become empowered knowledge workers.

“A powerful aid to help monitor plant performance”

Inform^{IT} Knowledge Manager Production and Process Management module drastically simplifies production management, covering production related functions like:

- production tracking and reporting
- process operations monitoring and reporting
- material storage management
- energy and emission reporting

Identifying the influences that process parameters have on product quality, production capacity, energy consumption and emission levels is now easier than ever. Powerful analysis tools are available at the click of a mouse button. After all, successful process information is key to your plant operation. The Knowledge Manager production management functionality provides production related functions including running plant overview and specific calculating and reporting capabilities for production, material storage and emissions. Reporting using standard formats is simply a matter

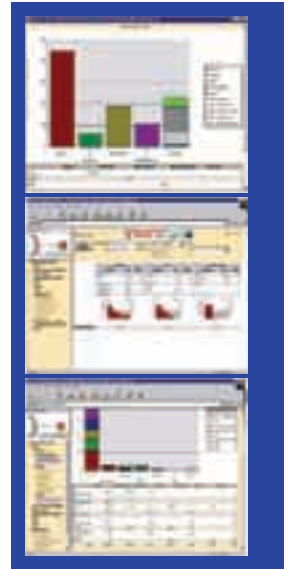
of clicking. The key to production planning is the on-line access to information without delays. Knowledge Manager provides reliable reports on the plant production situation: product stocks, capacities of process equipment, availability, etc. Better utilisation of energy, equipment, inventories and capacities can be expected. Process operation support helps process managers identifying the influences that process parameters have on product quality, production capacity, etc. It combines production related data, process variability, energy indexes, run-time quality parameters, etc. in comprehensive process operation reports. Connectivity to ERP systems (SAP, BAAN, PeopleSoft, etc.) is nowadays an essential tool to bring production data from floor level to enterprise management level. Knowledge Manager serves here as the information broker between real-time control and production environment and the transactional based ERP systems.

Production and Process Management

- Production management support
- Production reporting
- Production data analysis
- Energy reporting
- Stock reporting

- Production historian
- Process analysis
- Environmental recording and historian
- Environmental reporting
- Key Performance Indicators

Maintenance Support module



“Minimize plant equipment down-time”

Is down-time earning you money? Most definitely not. Reducing down-time and keeping up production capacity is vital for any production plant. And correct information is the key. The Inform^{IT} Knowledge Manager Maintenance Support module makes sure you know for certain what your most costly problems are, taking the guesswork out of maintenance by integrating facilities for easy identification of failing equipment. Pareto analysis is used to find out the real and most costly weak points in the production process and provides support for forecasting the next maintenance event.

Identification of failing equipment is based on event and alarm statistics. Results are issued daily/weekly in e.g. TOP TEN forms. Maintenance events of specific process equipment are forecasted by using equipment running hours, production totals, cumulative energy utilisation, etc.

Pareto analysis is based on predefined plant specific causes from the Fishbone diagram. Reliable statistical information on down time causes is the basis for corrective action. The information is essential for justification for capital expenditure, personnel training, etc.

Direct integration of information into your ERP (Enterprise Resource Planning) system is an obvious advantage. Transferring stop logs, running hours, down-time statistics, etc. to SAP's PM and PP modules for example are a matter of plug and play. It eliminates the work of the manual input through the SAP GUI. Although automatic, it allows for validation, manual correction and approval by the maintenance and production manager before transfer. Through interfaces like these, we protect your long term investments by making use of industry standards!

Improve plant equipment availability and efficiency.

Maintenance Support

- Maintenance forecasting support
- Root cause analysis
- Pareto analysis on production stops and failures
- Production stop and low rate reporting
- Key performance indicators
- Running hours administration
- Alarm and event historian

SPC module



CUSUM, or CUMulative SUM, chart, used for deviation control, with the V mask dynamically plotted.



“Correct **product quality** during production!”

Inform^{IT} Knowledge Manager SPC provides powerful tools to effectively monitor quality related process variables.

This information enables operators to compensate or to eliminate assigned causes before out-of-specification product is produced. In Knowledge Manager SPC trend functions X Chart, EWMA chart and CUSUM chart have been selected to match manufacturing process specific requirements. The SPC module also provides X-Y graphs (scatterplots) to plot two variables against each other to see the possible correlation between them and histograms for easy view of statistics of run-time quality measurements.

Under SPC, the quality is emphasized as a process characteristic. If the process is controlled and improved, product quality will be maximized automatically. Therefore, product specifications are normally left out of quality improvement activities until the process has first been optimized. Once the process has been stabilized,

product specifications are compared to process control limits to determine if the process is capable of producing CUSUM, or Cumulative SUM, chart, used for deviation control, with the V mask dynamically plotted the product to those specifications.

SPC control charts contribute to process and quality improvement in three ways:

- They provide a picture of the state of the process and the improvement of the quality over time;
- They provide information for correction of assignable causes and for improvement of the process;
- They indicate the process capability – what it is actually capable of doing during assignable cause correction and process improvement activities.

SPC

- X-charts (shewart)
- EWMA charts
- CUSUM charts

- Histograms
- X-Y charts
- Cross correlation charts

LIMS



The Laboratory Information Management System (LIMS) manages process quality information according to proven laboratory practices.

“Integrate laboratory management with enterprise-wide production”

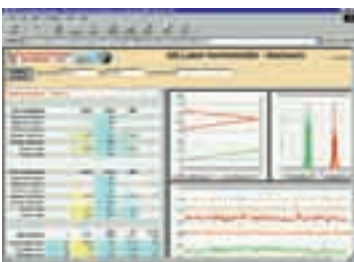
This management covers all laboratory tasks for the entire process and issues compliance certificates. All this is fully integrated with enterprise-wide knowledge management for functions like process, production and maintenance management.

Knowledge Manager LIMS provides advanced means of documenting quality information and makes it easily accessible in a transparent way. It provides operations with timely off-line information on the process, thus increasing actionable knowledge. Knowledge Manager LIMS provides

the foundation for direct process and process quality control on a day-to-day basis. It is designed to enhance process improvements and to provide a concrete basis for future product development.

Included are functions such as automatic and manual data acquisition, data validation, data consolidation, long-term storage, calculations, sample logging procedures, sample status reports, work lists, standard and compliance reporting features, easy-to-use trending and graphing plus options for Excel and SPC applications.

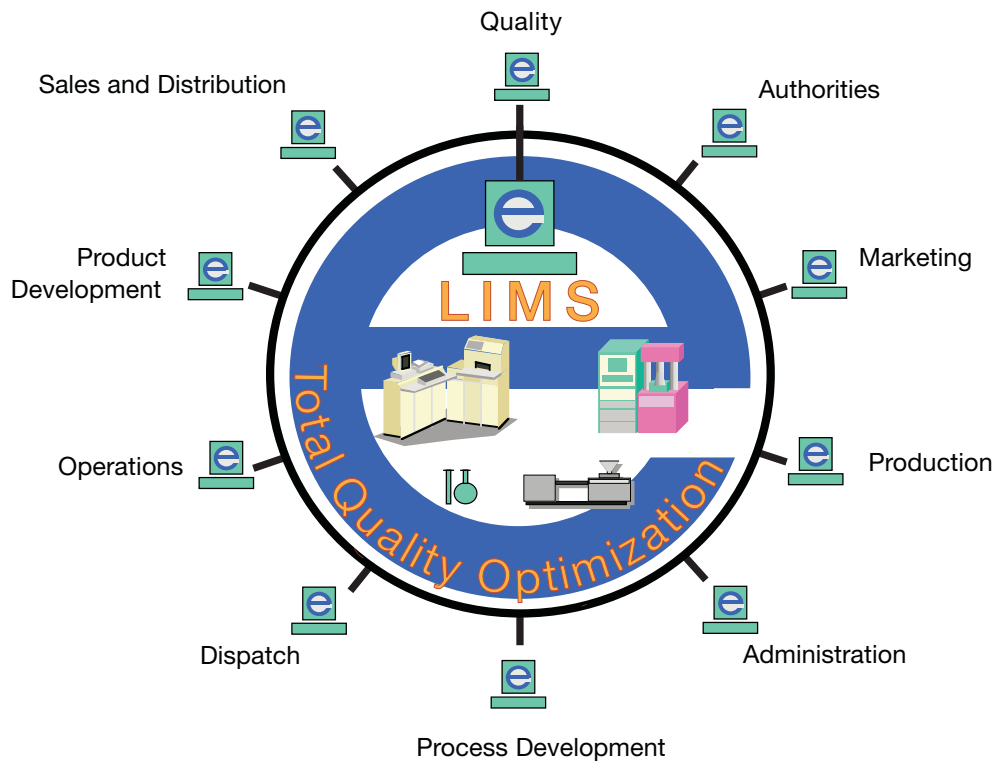
The Knowledge Manager LIMS module part of ABB's Advicent application suite is designed to manage process quality information according to proven lab practices.



LIMS

Integrated Total Quality Optimization

Quality data stored centrally can be used throughout the organization with LIMS.



In today's economic environment, quality requirements have been tied into each and every aspect of running a production facility.

With Advice^{IT} Knowledge Manager LIMS the quality-related information also becomes an integral part of plant information systems. Knowledge Manager LIMS provides seamless integration with the process control system, laboratory equipment, office automation systems and the business management systems.

From a quality management perspective, the ability to make process quality information centrally accessible to every business function is a critical issue. Managers responsible for production and sales expect efficient running of the business. Knowledge Manager LIMS is a powerful tool to assist with total quality optimization.

The quality information collected from raw materials, process and final products is divided into three different groups:

- Quality analysis to provide timely feedback to process control.
- Raw material and fuel analysis for recording and adapting production quality planning.
- End-product quality analysis for compliance reporting.

Laboratory Task Management

Specifications for Server Application

- **Knowledge Manager LIMS**

- **Business Objects**

- Data retrieval
 - Processing
 - Data formatting
 - Quality marking
 - Data dispatch

- **Knowledge Manager LIMS**

- **Configurator**

- Test/analysis configuration
 - Test/analysis plan
 - Sampling plan
 - Periodic check of equipment
 - Schedule configuration
 - Worklist
 - Manual entry
 - Report configuration
 - Links to external quality documentation



Sample management is a key element in LIMS.

This makes Advice^{IT} Knowledge Manager LIMS a reliable coordination and execution backbone in the day-to-day running of a professional laboratory.

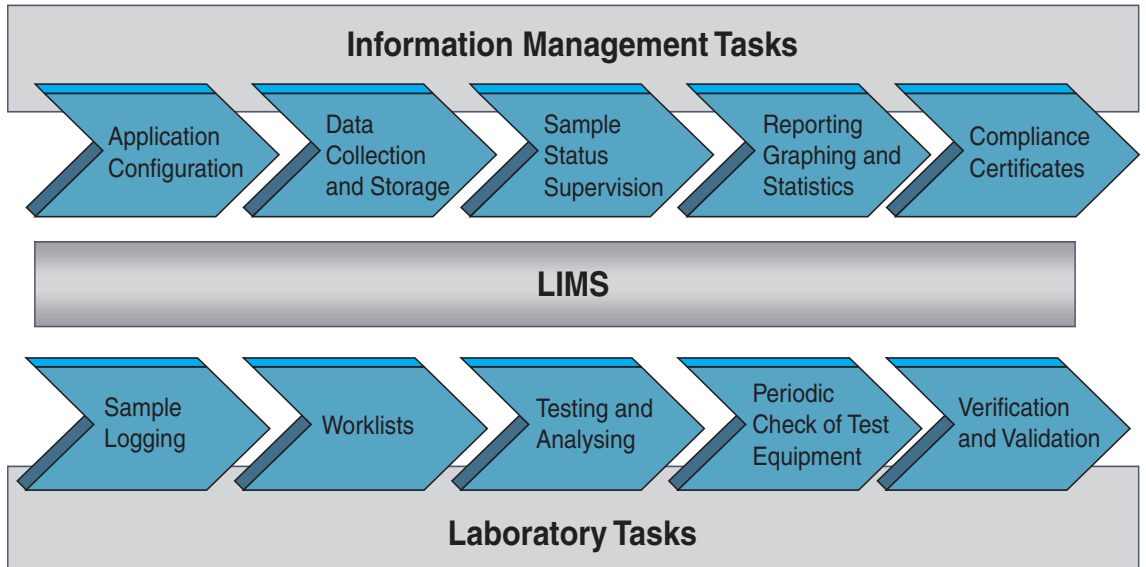
A multi-level user authorization scheme is applied for accessing, modifying and deleting sample records. The overall user access management is integrated into the local platform network. This means that Knowledge Manager LIMS users automatically receive assigned rights as they login to the office computer environment; there's no need for a separate login. Multiple users doing different tests and analyses are able to work with the same sample records.

Exception-based procedural actions such as manual corrections of results, validation overrides, sample data removal are accurately logged to provide complete history and traceability.

Bi-directional interfacing to test equipment and analysers allows automatic and errorfree result retrieval. The download of sample and job specific equipment setup parameters before starting the job is done automatically. Automatic scheduling further optimizes work processes.

Advice^{IT} Knowledge Manager LIMS supports two functions: information management and laboratory management.

The coordination of information management tasks and laboratory tasks makes LIMS a reliable backbone for the day-to-day running of a professional laboratory.



Sample management is the key to the setup of the Knowledge Manager LIMS. The sample can be divided into subsamples for backup and a series of predefined tests and analyses. Samples can be logged automatically from the control system, automatically according to a time scheme or entered manually.

Sample validation, approval procedures, test plans, worklists, scheduling of equipment's periodical check, bar code support are all standard features.



LIMS

- **Sample registration**

- Automatic or manual
- Customer specific sample ID
- Material group/name/location

- **Sample scheduling/worklist**

- Workplace specific joblist
- Work in progress
- Sample removal
- Automatic equipment setup download
- Automatic analysis/test data retrieval

- **Manual entry forms**

- Standard entry forms
- Customised specific entry forms
- Entry validation

- **Sample status list**

- Completion of tests
- Validation status
- 3-level spec conformity visualization
- Approval of tests
- Case-specific commenting

- **Sample survey sheet**

- Consolidation of sample data
- Analysis/test reports
- Quick charts
- Case specific commenting

- **Quality reports**

- Statistics: AVG, MIN, MAX, STD, Number of samples
- Colour-coded outliers
- Number of outliers

- **Compliance reports**

- Test accumulated
- Distribution graphs
- Normative requirements
- Colour-coded outliers

- **Graphical presentations**

- Standard quality chart
- Charts with specification limits (auto control)
- Moving average charts
- Conformity charts

Bilmat module



Mass balance data adjustment is one of the most common calculations performed in mineral processing engineering.



Validated information is a must in a competitive environment. Plant managers need coherent and reliable data to make decisions.

“A solution for **advanced data reconciliation** through mass balancing...”

Process data reconciliation by mass balancing provides accurate data and gives access to variable values that cannot be measured. Within a fully integrated Inform^{IT} Knowledge Manager production datawarehouse for process and laboratory information, the Bilmat module offers the ultimate instrument for taking advantage of accurate, coherent and automatically reconciled information.

The primary objective and application of the Knowledge Manager Bilmat module is data reconciliation through mass balancing. The Knowledge Manager Bilmat module reconciles stream phase distributions and flow rates, as well as complete and incomplete analyses of the phase of interest. Knowledge Manager's Bilmat module can estimate missing variable values. It performs a sensitivity analysis to determine the accuracy of its own results. The Knowledge Manager Bilmat module can also reconcile subanalyses in the mass fractions of a complete analysis. Production Mass Balancing, the reconciliation of data on cumulated tonnage, is typically done every shift, batch, day, week, month, etc. The necessary real-time and historical information on

process measurements and assays is automatically retrieved from the production data warehouse in the Knowledge Manager environment. The reconciled information is stored back for future reference, analysis and metallurgical accounting.

Indicative Mass Balancing is the automatic and on-line reconciliation of real-time data. Data from instrumentation and assays always come with an unidentified error. Indicative Mass Balancing provides more accurate and validated information for process monitoring and optimization, consistent, continuous and instantaneous.



Get the most out of your process data

- Operators have access to accurate process variable values, some of which cannot even be measured;
- Process engineers tune process equipment and validate process efficiencies computed from coherent and reliable numbers;
- Control engineers tune sensors, controllers and select setpoints from reliable data;
- Production managers receive frequent and accurate process efficiency estimators;
- Senior management is kept informed correctly about ongoing production with almost real time data.

In process audit projects and simulation studies, the Knowledge Manager Bilmat module offers the best possible information:

- The design and process engineers have access to data of high quality to recommend new devices, new reagents or other process improvements;
- The research engineer has access to smoothed data to build reliable process models.

With its advanced features, Knowledge Manager Bilmat module has always been ahead of its competitors. Direct integration with process measurements and lab data offers many advantages:

- Reduction of time and effort for data acquisition and preparation;
- Reduction of sources of error;
- Data visualization and report generation;
- Configurable by non-IT skilled professional metallurgical staff;
- Logging of reconciled data and corrected error models in the production data warehouse for analysis.

Bilmat

Applications

- Reconcile production data and rapidly generate accurate production reports
- Estimate in real time non measurable variables and improve process operation
- Compare production strategies on accurate production data
- Identify accurate process unit models
- Develop soft sensors and design new control strategies
- Simulate sampling strategies and maximize instrumentation investment

Benefits

- Speed-up the generation of production reports
- Validate mass balance results
- Improve the assessment of performance indices (production yields, circulating loads, metal recoveries, etc.)
- Optimize process tuning and setpoint selections
- Maximize the benefits of process auditing projects
- Maximize the return on investment on sampling strategies and instrumentation acquisitions
- Optimize efficiency in data collection and computation
- Visualize data and generate reports in a web-based environment
- Feed reconciled and validated data to business systems



Using Knowledge Manager's Bilmat module on a day-to-day routine empowers many functions in the plant

Personal Assistant

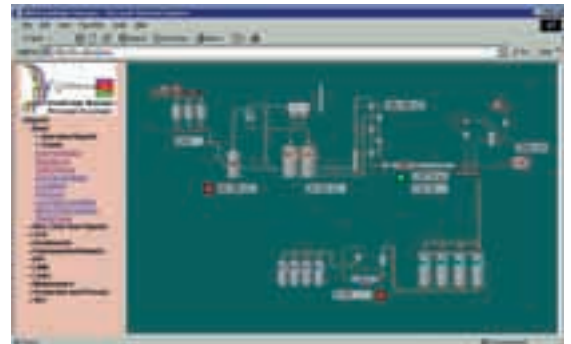
The Knowledge Manager Personal Assistant brings all Knowledge Manager server functions to the desktop of the manager. It provides comprehensive and easy-to-use graphical tools based on the latest HTML technology.



“**Monitor** your plant performance”

There is no need to install any additional software on the client PC; a Web Browser is all you need. You simply address the Knowledge Manager server to start working.

Knowledge Manager is the first true web-based technology product in the CPM - Collaborative Production Management world. Whereas others are yet to start, Knowledge Manager has reached full maturity in the product life cycle while keeping on par with the latest technology features. The thin client approach is just one of them.



Provides server functions at the desktop

Personal Assistant

- Web-browser
- Native language support
- Full window to the server application
- Alias working mode
- User preferences
- User specific folders
- User configurable reports
- User configurable trending
- User configurable filters
- User configurable log calculations
- Manual data entry
- Data drill-down
- Graphical display of data dependencies
- Data correction
- On-line Help

Metallurgical Accountant module



“Metallurgical balances **faster and better** ...”

Knowledge Manager's Metallurgical Accountant module is a full production accounting add-on, developed to solve the specific requirements of the mineral processing industry.

Metallurgical Accountant transforms accumulated process data, as flow rates and assays, into coherent information, ready for production reporting and performance indication. Developed by Algosys, Metallurgical Accountant ensures full coherency of available data while improving data quality through a reconciliation process of mass balancing. The reconciliation is handled by Bilmata, Algosys' powerful mass balancing engine. Measurements that are often acquired at high costs with on-line sensors and analyzers, or sophisticated laboratory equipment are used to their full extent. Accessing the high value information contained in Metallurgical Accountant is very simple. Authorized personnel can access metallurgical

accounting reports, production reports, mass balance results, performance indicators, etc. These can also be automatically e-mailed to the decision makers of the organization. Authorized users can drill down into each of the results to consult the data hierarchy, the calculations and the input data that produced the particular result. The strength of Metallurgical Accountant in a Knowledge Manager environment is the full and true integration of all production and laboratory data: a single user interface, a single database, a single configuration tool, and so on. Through integration, contextual information is derived and maintained, enriching the overall value of collected data. With Knowledge Manager's Metallurgical Accountant module, metallurgical accounting and production reporting effort is reduced from several hours, or days, to minutes. Information reliability and availability is maximized.

Metallurgical balances and full reconciliation within minutes.

Metallurgical Accountant

- Production accounting overviews
- Metallurgical balances and reports
- Production mass balance on flow rates and assays
- Recovery and performance indicator calculations
- Data drill down / result transparency
- Configurable plant flows
- Reconciliation validation
- Manual data correction / adjustment
- Dispatch connectivity
- ERP connectivity
- Integrated LIMS or 3rd party connectivity

Excel Add-In module



Data available
in Excel



“Ad hoc reporting **quickly**”

Is ad hoc reporting
keeping you busy
for hours?

Sourcing the right information from everywhere, manually typing it in, transferring it to the right format, etc. for a report that had to be ready yesterday? The Knowledge Manager Excel Add-In module makes user specific adhoc reporting much easier. And you don't need to know SQL*Net. You can run queries directly from the Excel spreadsheet without the need to

write SQL queries. You simply select the data required. With underlying direct web queries, the data is retrieved from one or more servers simultaneously. The data is available for further processing and formatting with standard Excel functions.

Excel Add-In

- Retrieval of all available data to Excel
- Bi-directional for bulk data correction
- Multiple retrievals per spreadsheet
- Easy pick & choose

- Shortcut buttons for common selections
- Pre-configured and ad-hoc reduction types
- Tag browser

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ABB Inform^{IT} Knowledge Manager

Inform^{IT} Knowledge Manager is a Web-based process information management engine based on the 5R principle:

Relevant information is to be provided at the Right time, at the Right place, in the Right form, and to the Right people.

More than 300 installations worldwide are using ABB knowledge-based solutions for information management and process optimization.

As a world leader in process specific CPM – Collaborative Production Management – ABB is continually developing cutting-edge technology.



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