

QCX/System – General Description

– unmatched software functionality for quality control & quality assurance in minerals & metals industries. Designed for both central laboratory and at-line analysis concepts.

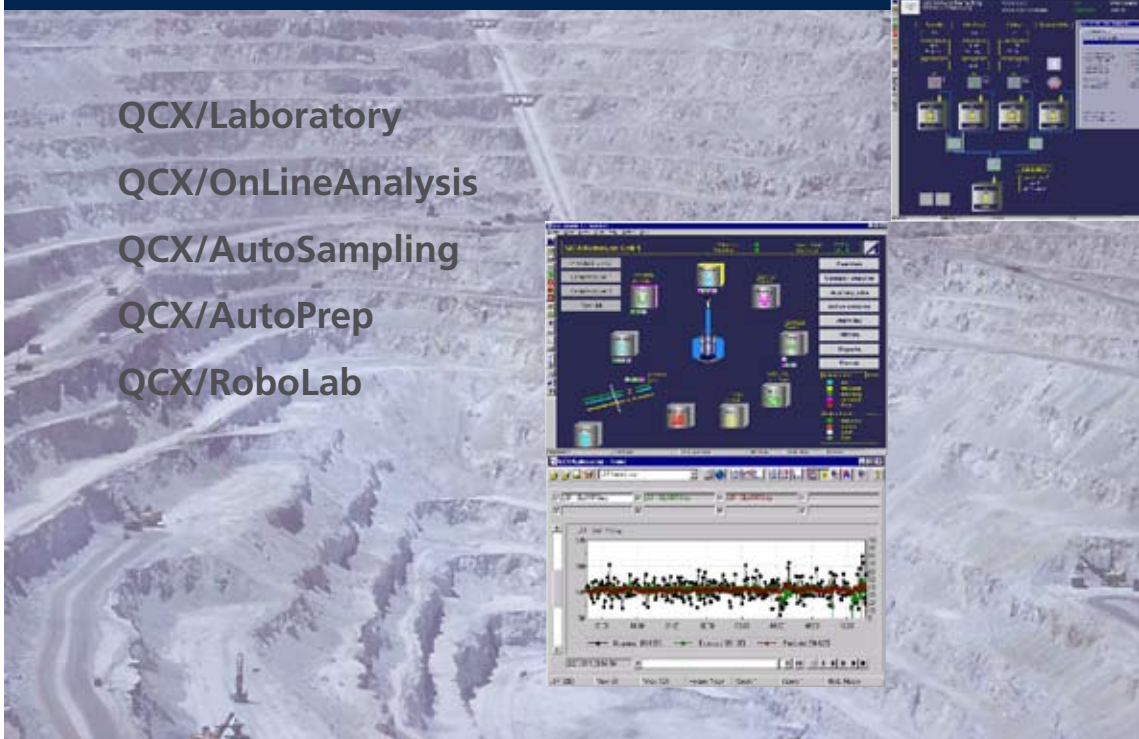
QCX/Laboratory

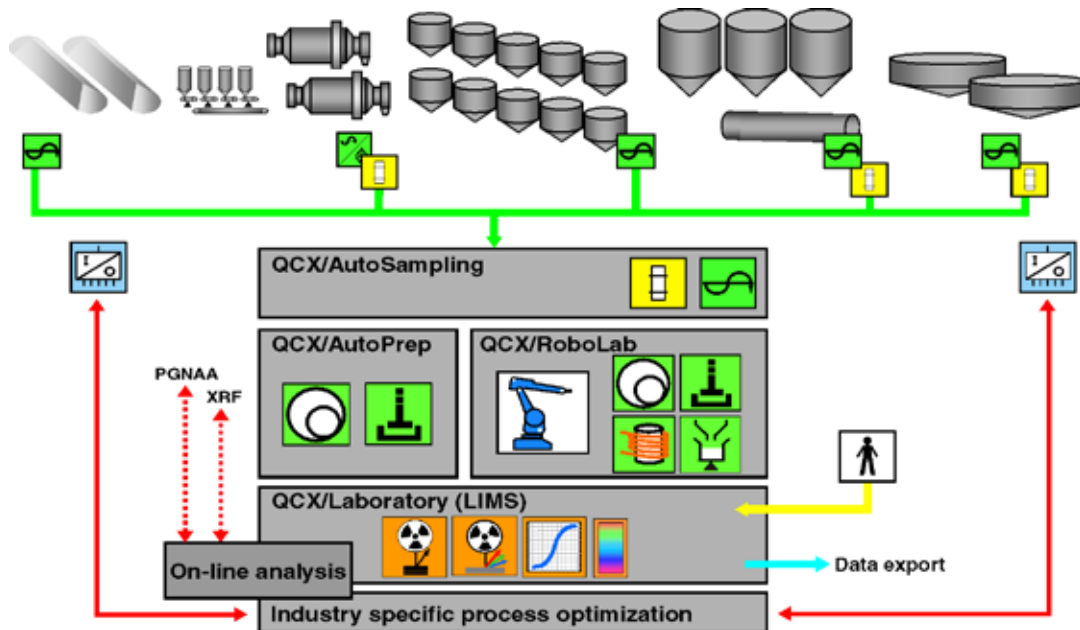
QCX/OnLineAnalysis

QCX/AutoSampling

QCX/AutoPrep

QCX/RoboLab





Application

Based on the key activities sampling, sample preparation and analysis, it is the main task of any production laboratory to provide fast and reliable data for process quality control and quality assurance throughout the production process. FLSmidth Automation’s QCX quality control system incorporates all these key activities in an integrated system architecture, allowing for any degree of automation. The concept supports both traditional laboratory automation and on-line analysis or combinations hereof.

Originally developed for X-ray based cement quality control, the system concept has during more than 35 years of continuous development been expanded to support a wide range of sampling and laboratory procedures in different industries.

The QCX system structure supports customized integration of PC’s, analytical instruments, sampling & sample preparation equipment, robotics and on-line analytical sensors. The general process I/O facilities of the kernel software layer provides seamless access to analog process measurements, digital status information and control loops. The modular architecture allows for scaling between small process optimization configurations for quality control (based on lab or on-line analysis techniques) and large, fully automated sample preparation & analysis and laboratory information management systems. The QCX concept fully meets the high and mandatory requirements for reliability and robustness in an industrial environment.

System modularity

The heart of the QCX System is the QCX/Laboratory module. This module in any combination with other QCX application modules provides general support for sampling, sample preparation and analysis - at the desired level of automation - and reporting at all relevant stages in a minerals/metals processing facility. The concept offers a unique combination of LIMS (Laboratory Information Management System) and LAS (Laboratory Automation System) functionality, optionally integrated into a process control environment. Selectable options as well as a high degree of customization of single steps in the LIMS/LAS procedures ensures

conformance with project specific requirements. The available QCX application modules are:

QCX/Laboratory

is the kernel module of every QCX System and provides basic software functionality such as sample administration, sample tracking, sample database, data import/export, user access control, equipment control and data acquisition and report generation facilities. The module is delivered with a selection of project specific communication drivers for the integrated preparation and analytical equipment units. An available options is “SPC” with statistical process control facilities. Alternatively to utilizing QCX’s LIMS features data may be exported to a 3rd party LIMS, in which QCX acts as a front end automation and data acquisition system.

QCX/AutoSampling

for fully automatic execution of sampling, in-process sample preparation and sample transport

QCX/AutoPrep

for fully automatic sample preparation based on dedicated fully automated equipment units.

QCX/RoboLab

for fully automated, robotics based, sample preparation and analysis with a high degree of flexibility for individual solutions.

QCX/OnLineAnalysis

supports a variety of brands/types of on-line/at-line analytical instrumentation with comprehensive facilities for data storage, graphical presentation, statistical treatment, analyzer status etc

For high-level process optimization applications involving chemical parameters, the QCX system can easily pass on analytical data with most high-level process control systems on the market, and hereunder FLSmidth Automation’s ECS/ProcessExpert system.

Software platforms

The QCX system operates under Microsoft Windows 2000/2003/XP. The state-of-the-art windows techniques and software components & tools comprise:

- Windows 2000/2003/XP operating system
- a true client-server architecture based on object oriented software components developed using Visual Studio v6/v7 and .NET for the newest applications
- Microsoft SQL 2000 relational database
- a three-tier software model, separating the database, the application software and the presentation software
- clear structural separation of routine operator level functions from less frequently used functionality such as data configuration and special utilities
- graphic interfaces for all operator level functions, complemented by comprehensive windows style dialogues for data configuration and special functions
- integrated comprehensive and flexible reporting & trending utilities based on 3rd party software products
- easy data connectivity to a wide range of standard PC software products: spread sheets, data bases, word processors etc
- open system environment provided by Microsoft/ActiveX technology based on DCOM (Distributed Component Object Model) and including OLE Automation interfaces for customized solutions
- options for data links to business administration systems
- enhanced data security provided by options for on-line data replication or mirrored hard disks

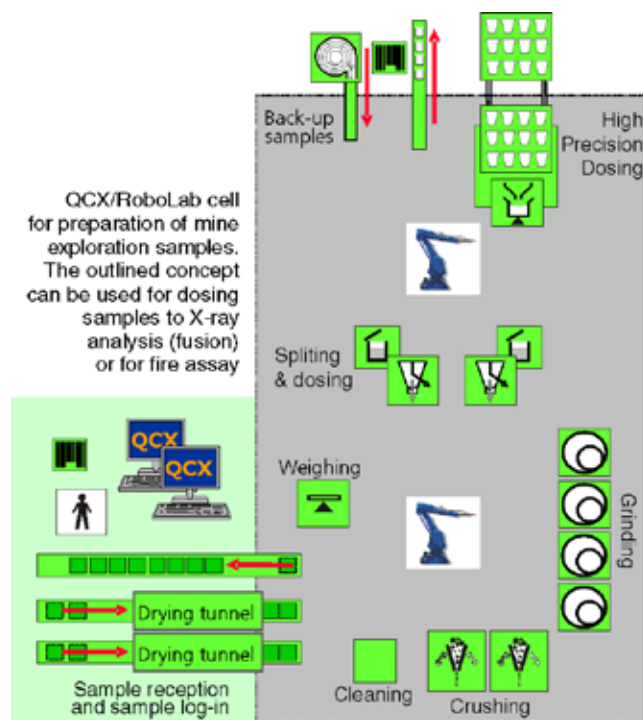
Basic software functionality for:

- client/server handling
- alarm/event handling
- process I/O from the plant control system
- user access control
- various system utilities.

are supported by the ECS layer of the system software (please refer to diagram on next page and other FLSmidth Automation documentation for further description)

Software license structure and basic functionality

For single PC server configurations obviously all included QCX software application modules will be accessible from this single QCX Server PC only. Larger configurations may incorporate a QCX Server PC (hosting all QCX data bases) and one or more QCX Client PCs. The software is licensed to allow a project specific number (= 'n') concurrent clients to operate in parallel to the QCX Server PC. While all functionality can always be accessed from the QCX Server PC, a QCX Client PC supports either a) all QCX/Laboratory functionality, e.g. basic data presentation features such as on-screen and printed reports, trend curves and basic utilities, or b) all QCX/Laboratory functionality + any one of the other licensed QCX application modules in the specific system (same module on all clients), or c) all QCX/Laboratory functionality + all other licensed QCX application modules in the specific system. One or more icons represent each QCX application module. All frequently used routine actions (operator level) are supported by graphical user interfaces as well as by menu-driven dialogue principles. Less frequently used dialogues for configuration, inspection and special functionality are separated from the operator level functions and supported by menu-driven dialogues.



System databases

The QCX System is built upon a number of SQL databases holding all relevant system parameters for the various application modules. The following master data entities are of key interest in all modules of the QCX System:

- Users
- Equipment Units
- Data Items
- Sample Groups
- Programs (= preparation/analysis parameters)

Most of the data items connected to these entities can be modified by a user with adequate privileges at any time. However, the majority are defined prior to delivery and/or during system commissioning, e.g. once and for all when the system has been configured in accordance with the specific project requirements. Acquired analytical data (= historic analytical data) and associated parameters are stored in a separate SQL database with dynamic access over a time horizon, which in principle is only limited by the available disk capacity. Typically, a two year dynamic sample data base horizon is defined.

User access control

At the initial configuration of the system it is to be decided if the 'user log-in' facility should be activated and - if so - if also the optional pass-word protection facility shall be enabled. The user access control facilities offer a convenient and safe method of determining who shall have access to which functionality and to stamp certain actions with the identity of the responsible operator.

The system is delivered with a pre-defined set of privileges belonging to a given user profile, but the pre-defined set-up can be modified, and customization of individual user profiles is possible. As an example, an operator who otherwise has the same basic privileges as his colleagues can be given exclusive access to perform calibration of a given analysis instrument.

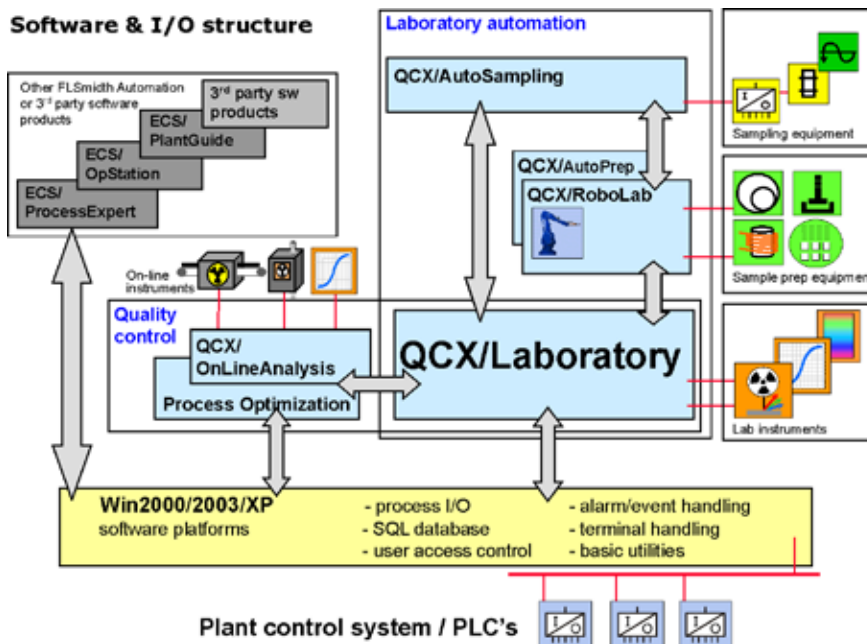


QCX software controls this automated laboratory with its sample infeed, coarse sample preparation, milling and splitting and fire assay dosing cells

Hardware configurations

QCX runs on PCs under the Windows 2000/2003/XP operating system. Hardware requirements will vary from small QCX configurations to large distributed LIMS configurations with a high degree of automation.

For large systems, such as QCX/RoboLab, high-end server PC's should be considered. Available hardware options include mirrored disc configurations (RAID technology), providing a higher degree of safety against data loss. The computer equipment is connected via a local area network (LAN). Automatic laboratory equipment is also interfaced via the LAN or in some cases via PLCs.



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