CementTesting

'CementTesting' complements the QCX/Laboratory package with smart data handling features for conformity testing of cement.

What is 'CementTesting'?

'CementTesting' is an optional add-on module for the QCX/Laboratory™ software package. It enhances the LIMS functionality of QCX/Laboratory; it ensures one common and uniform interface to all data and analysis generated through both manual and automated analysis & test procedures. It supports planning and scheduling of physical tests, collects analytical data, generates work lists, conformity tests, reports. The data treatment and reporting, operates in accordance with relevant EN/ASTM norms (optionally configurable to work with other norms).

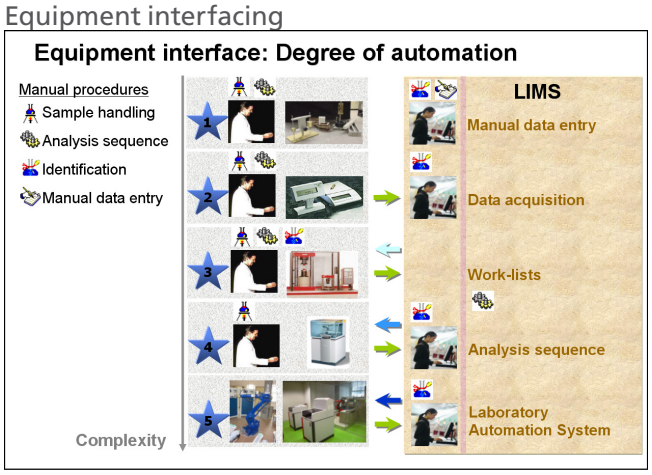
Description

Cement testing standards impose requirements on physical, mechanical and chemical properties and on the statistical methods used to check conformity.The properties are measured on different types of test equipment. Thus, traditionally conformity testing has required a significant amount of manual result transfer and manual calculations.

The CementTesting software supports all procedures from scheduling and planning, through testing, data acquisition and long term data storage, to the final conformity report. Often many work places will exist in the laboratory; ideally a given operator should only see information relevant for him, e.g. the shift operator responsible for physical testing should only access UI's (user interfaces) and data relevant for physical tests.

Without a LIMS test data is normally stored in 'homemade' local database or spreadsheet solutions. As a consequence scheduling, planning, analysis and conformity testing must be done locally using different applications and no consistent long term data storage is supported. With CementTesting data is stored in a central database. Scheduling, planning and analysis is supported by the LIMS (=QCX/Laboratory) .
Long term data storage is supported in a commercial database (MS SQL).Conformity testing is done in a unified way since all quality data are stored in the central database

Equipment interfacing



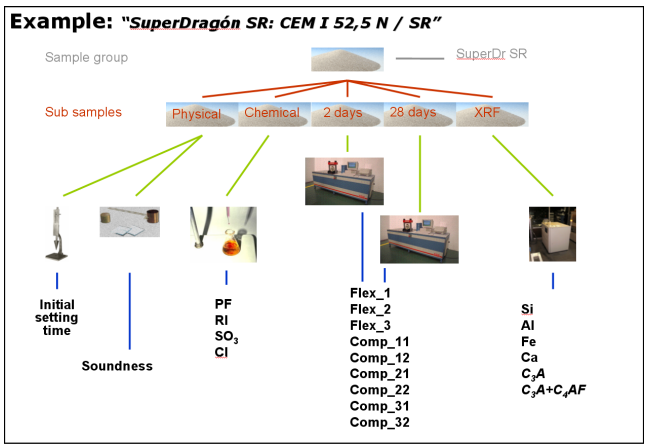
Test/analysis equipment can be interfaced in different ways:

1. *The simplest 'interface' is manual data entry. All sample handling and analysis is manual. Data is entered manually into the LIMS. Configurable data entry forms are supported*
2. *The next level is data acquisition. Sample handling and analysis is manual. Data exported from the analysis instrument is acquired after identification of the sample.*
3. *A work-list may be submitted automatically to the equipment PC. The operator selects an already identified sample and after testing data is automatically transferred to the LIMS.*
4. *The analysis sequence is controlled from the LIMS. After completion of the analysis data is automatically transferred to the LIMS.*
5. *Sample handling is automated using a LAS (like QCX/RoboLab). After completion of the analysis, data is automatically transferred to the LIMS.*

(In a QCX solution LIMS = QCX/Laboratory)

Example of CementTesting procedure

This is an example of how tests for sulphur resistant cement could be modeled in a LIMS. Note that the model closely follows the



'real world' division of the sample into different preparations and the use of various analytical equipment.
It is important that the LIMS supports this type of nested modeling. The LIMS also supports creation of placeholders for test results as well as formulas for evaluation of derived, calculated results.

Planning of Strength tests

If 5 types of cement are produced according to EN 197-1, then 20 strength tests, 10 early and 10 standard, will be registered every week. Since it takes 28 days to complete standard strength tests, there will always be around 40 active standard strength test samples. The tests must be completed within the specified time

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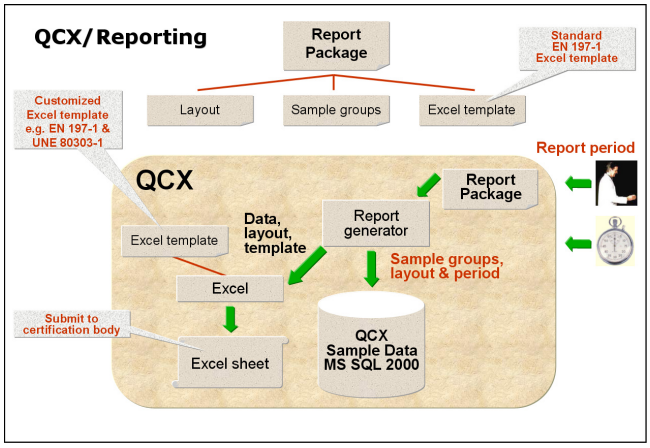
limits. Therefore it is important that the software supports planning of the analysis to be completed in a given shift

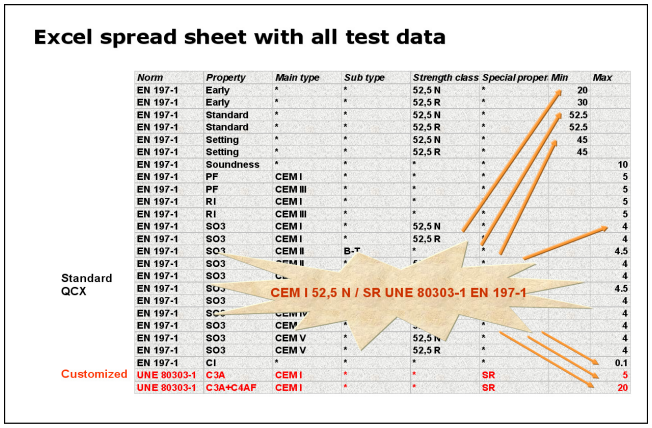
Test Planning

Given age and limits, equipment work-lists can be generated for specified periods of time, e.g. a shift. The work lists can be printed and assist the operator in his work planning.
In a more advanced solution the work-list may be automatically submitted over the network to the actual test equipment used to conduct the physical tests. In this way the work-list can be displayed on the PC controlling the test equipment. When starting test for a specific age the operator electronically selects the corresponding item for the list. After conducting the tests the results are automatically transferred to the LIMS.

Reporting & conformity testing

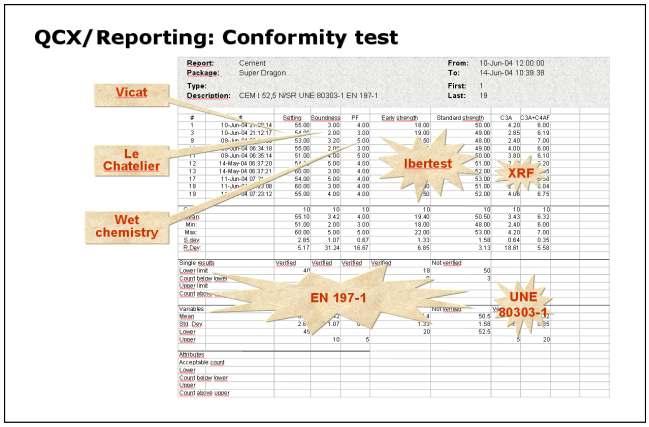


The diagram shows an example of automated conformity testing. Conformity testing according to EN 197-1 is implemented in MS Excel. Characteristic values are stored as Excel sheets. After retrieving data from the relational database they are transferred to Excel. Here conformity testing is performed and the results are stored in an Excel sheet.
Characteristic values according to local standards, e.g. UNE 80303-1 (Local Spanish norm), are added to the Excel sheets. The final report may be stored electronically on the office network and submitted to the certification body.
CementTesting allows for future updates to EN and local standards and the solution supports future production of new cement types. The diagram below shows characteristic values configured



in an Excel sheet. The top rows correspond to the general properties defined in EN 197-1.The 2 bottom rows corresponds to special properties defined in UNE 80303-1.

In the final conformity test report each column corresponds to a property in EN 197-1 or UNE 80303-1. The bottom rows show the



results of the conformity test. Even-though the test results originate from different analytical equipment, they are reported in a uniform fashion.

Summary and benefits

CementTesting incorporates data handling concepts, which may greatly simplify conformity testing procedures. The data base tool is the widely applied relational database 'MS SQL', which means high flexibility and open user access.
Especially for strength testing it is important that the application supports planning, scheduling and generation of shift work-lists.
Both (semi) automatic data acquisition and manual data entry procedures are supported..
The software implements both requirements and statistical methods, and it is possible to adapt the applications to requirements imposed by local standards.
The software is open and flexible so that new cement types can be implemented in the future, and it supports automated conformity testing including documentation. Therefore final reports documenting conformity can be stored electronically on the office network, accessible through the company's intranet.
With the CementTesting option you will save documentation and reporting time, the risk of manual errors in documenting results is reduced, test results will be presented in readable formats, and unconformities to norms will be detected instantly.

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