Essential Checklist for

OPTIMIZING QUALITY CONTROL LABORATORIES

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Essential Checklist for Optimizing Quality Control Laboratories

This checklist will demonstrate the key opportunities for improving quality control laboratory processes, from the sampling schedule or control plan to the delivery of analysis results.

The quality control laboratory process generally follows the following sequence of stages:

- **Definition of control plans and sampling schedules;**
- **Sample management;**
- **Reception of samples;**
- **Distribution of the analyses;**
- **Execution of the analyses;**
- **Review of the analyses;**
- **Publication of the results.**

In this eBook, we dive straight into the realities of each stage—and uncover powerful opportunities for improvement—through the transformative lens of laboratory automation and informatics.

1. Definition of Control Plans and Sampling Schedules

Typical Reality

a) Control plans or sampling schedules are defined in documents, and their compliance depends on the experience and discipline of the users. Deviations occur in the frequency of sample collection or in compliance with the pre-established control plan.

b) Excessive manual work for recording periodic samples (sampling schedules) from production, environmental or occupational health points.

Opportunities for Improvement

a) Configuration of control plans and sampling schedules directly in the system, ensuring correct compliance with the collection and analysis frequencies performed.

b) Elimination of time wasted in sample recording thanks to the possibility of automatic sample creation based on the sampling plan in the case of periodic samples.

2. Sample Management

Typical Reality

a) Loss of time and errors in organizing sampling material and generating labels.

b) Recording of sampling and field analysis on paper, with subsequent waste of time in receiving samples due to data transcription, prone to errors and requiring physical space to store paper records.

Opportunities for Improvement

a) Automatic generation of labels for sampling containers or bottles, indicating the types and storage conditions, streamlining preparation and avoiding errors.

b) Recording samples directly on electronic media using tablets or smartphones, eliminating transcriptions, saving time and errors, and reducing the use of paper, printers, supplies, and storage space.

3. Reception of Samples

Typical Reality

a) Manual recording of samples in notebooks, spreadsheets, or even custom-made, non-integrated software, which prevents the reuse of information from other systems or sampling forms, generating a heavy workload and greater demand for personnel.

b) Errors in recording information due to excessive transcriptions of data from other systems or sampling forms, which are often dirty or have records that are difficult to read.

c) Failures in the scope of the analyses assigned to the samples, as these are linked based on the reading and interpretation of other systems or sampling forms. This creates critical problems such as the delivery of results without the requested analyses or the performance of unnecessary analyses, which leads to rework and waste of time and material resources on unnecessary tests.

Opportunities for Improvement

a) Automatic sample recording through integration of the laboratory system with the company's other systems, creating event-based samples from batch controls for raw materials and finished products. This reduces workload in the receiving area and makes the process more reliable.

b) Automatic recording of information from other systems or from sampling conducted electronically, transmitted directly to the respective samples. This eliminates errors associated with manual transcription that could lead to rework in the future.

c) Automatic assignment of predefined analyses in other systems or control plans, which simplifies the sample reception process and ensures that the analyses to be performed are exactly as planned.

4. Distribution of the Analyses

Typical Reality

a) Generation of service orders, online spreadsheets, or home-based systems that basically detail the analyses to be performed on the samples received. At this stage, a lot of time is wasted transcribing information from the sample record.

b) Manual distribution of the analyses to be performed among the laboratory teams, which creates a bottleneck in the process, since the entire execution depends on the availability of a professional to perform the pre-distribution. This causes downtime, delays in assignment, and failures in prioritizing analyses, thus compromising the delivery times of results to other areas of the company.

Opportunities for Improvement

a) Elimination of the need to generate service orders, since sample analyses are automatically available as tasks to be performed in the corresponding lists of each laboratory involved.

b) Automatic distribution of the analyses to be performed directly to the laboratory teams, according to the corresponding laboratory and with automatic prioritization based on predefined deadlines. This eliminates the process bottleneck, providing agility and simplicity.

5. Running the Analyses

Typical Reality

a) Recording raw analysis data (measurements, observations, and other traceability records) in online spreadsheets to perform calculations and obtain the final analysis result. In the case of instrumental analysis, printing results on paper and transcribing data.

b) Parallel controls for equipment calibration, analytical input inventory, and analytical quality controls are often performed using electronic spreadsheets or other paper records, which takes time for analysts to review the information and hinders traceability in the event of audits.

Opportunities for Improvement

a) Recording raw data directly in an electronic environment using smartphones, tablets, or computers, as well as data acquisition directly from the analysis equipment, minimizing or even completely eliminating manual record-keeping. Furthermore, with the automatic calculation of analyses according to the established method, significant time savings are achieved and errors caused by transcription or manual calculations are eliminated.

b) Complementary equipment calibration controls, inventory of supplies, and analytical quality controls fully integrated with the analytical methods, so that the system only allows the use of calibrated equipment and supplies within their expiration dates, and requires and executes analytical quality controls throughout the laboratory's analytical process.

c) This ensures greater reliability, productivity, and full traceability, facilitating future audits.

6. Review of the Analyses

Typical Reality

a) To minimize errors from transcription and manual calculations, a review stage is implemented to verify all transcriptions and calculations whenever possible.

b) In addition to the individual review of each analysis, a critical analysis process of all the results obtained in the sample is usually carried out, in order to identify possible deviations or correlations that may indicate flaws in the analysis.

c) Obviously, all of these manual review processes are, to a greater or lesser extent, prone to errors, which allows some flaws to go unnoticed and undetected.

Opportunities for Improvement

a) Removing transcription and manual calculations makes the process more reliable and reduces errors, so the manual review step is no longer needed.

b) It is also possible to automate critical analysis routines of sample results, systematizing the verification and communication of all possible deviations (configurable by the user) in an extremely fast and reliable manner.

c) By eliminating these slow and error-prone processes, professionals achieve significant time savings in their daily routines, while ensuring high reliability in the analysis results.

7. Publication of the Results

Typical Reality

a) Large volumes of analysis results are received periodically and must be reviewed and, in some cases, signed off. Since they are typically received once or twice a day, they create downtime and a critical bottleneck in the release of results to other areas.

b) This task is usually handled by highly qualified and costly professionals, such as technical managers or supervisors, who are already in high demand. As a result, it's often delayed until the end of the day, leading to longer hours, increased stress, and a higher risk of errors.

c) Communicating analysis results to other areas of the company is typically done by recording the results in online spreadsheets or, in some cases, by email or even by phone. This method of sharing results is prone to errors, and consumes the time of laboratory and other department staff.

d) Manual, repetitive tasks often dominate the workday for many professionals. For technical managers, the impact is even greater: without automated tools to analyze results, these highly skilled experts spend countless hours on routine activities. This not only wastes valuable talent, but also limits their ability to enhance analytical processes, cut costs, and boost the reliability of results. By automating analysis, technical managers can focus on driving innovation and delivering greater value to their organizations.

Opportunities for Improvement

a) Elimination of pending analysis results awaiting review and delivery. Once the last pending analysis of the sample is completed and released by the laboratory, the sample is immediately available for publication (electronic signature and automatic generation of the analysis report when necessary), thus eliminating bottlenecks and downtime in the process.

b) Since support mechanisms can be implemented for reviewing each analysis before release, such as comparison with acceptance criteria and statistical analysis, many errors are detected and corrected during the laboratory process itself. Furthermore, upon completion of all analyses for a sample, the automatic review mechanism can detect questionable results or inconsistencies between sample results, notifying those responsible or even automatically requesting a reanalysis or, if appropriate, automatically releasing samples that meet pre-established criteria.

c) Typically, communication of analysis results to the company's departments can follow one or more of the following paths:

I. Integration with the company's other systems (ERP, MES, PIMS, WMS, CRM, etc.), allowing users to access and view information in their respective daily work interfaces;

II. Access to a results portal or query within the laboratory's own system, where it will usually be possible not only to view the results for a specific batch or collection point, but also to view historical results and related key performance indicators(KPIs);

III. Sending emails automatically generated by the system, indicating the analysis results, deviations, or simply nonconformities.

d) By removing transcriptions, manual calculations, and errors—and automating reviews and publication—the process of publishing results becomes faster, simpler, and more reliable. This saves valuable time for key professionals and boosts laboratory efficiency.

Essential Checklist for Optimizing Quality Control Laboratories

Understanding the key stages, realities and opportunities for improvement in a typical quality control laboratory, use this checklist to help optimize your process:

1. Definition of control plans and sampling schedules:

- ☐ Provides configuration of control plans and sampling schedules.
- ☐ Enables the automatic creation of periodic samples.

2. Sample management:

- ☐ Automatic generation of labels indicating the materials to be prepared for sampling.
- ☐ Recording of field sampling and analysis information directly in electronic media.

3. Reception of samples:

- ☐ Automatic creation of samples from batches of raw materials or finished products.
- ☐ Through integration with other company systems; elimination of transcription by automatically recording sampling information to samples.
- ☐ Automatic assignment of predefined analyses to control plans or other systems.

4. Distribution of the analyses:

- ☐ Elimination of service orders or other paper documents.
- ☐ Automatic distribution and prioritization of analyses to be performed directly to laboratory teams according to agreed deadline.

5. Execution of the analyses:

- ☐ Recording measurements and analysis observations directly in electronic media, as well as automatic calculation of results.
- ☐ Automatic implementation of equipment controls, inputs, and analytical quality control.

6. Review of the analyses:

- ☐ Elimination of manual analysis review steps.
- ☐ Implementation of automatic routines for critical analysis and review of results.

7. Publication of the results:

- ☐ Elimination of batches and the bottleneck in the publication of results.
- ☐ Automatic review of analyses and communication of deviations to those responsible.
- ☐ Automatic publication of samples when they meet pre-established criteria.
- ☐ Automatic communication of results to departments through integration with other company systems or via the portal.

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