1. Imre KISS, 2. Péter KOŠŤÁL, 3. Tamás HARTVÁNYI, 4. János NÉMETH, 5. György KOVÁCS

IMPROVING THE QUALITY IN INDUSTRIAL AREAS WITH ADAPTED METHODOLOGY FOR A BETTER ENTERPRISE DATA

■ **Abstract:**

In engineering and manufacturing, quality control and quality engineering are involved in developing systems to ensure products or services are designed and produced to meet or exceed customer requirements. These systems are often developed in conjunction with other business and engineering disciplines using a cross-functional approach. Quality assurance is the activity of providing evidence needed to establish quality in work, and that activities that require good quality are being performed effectively. All those planned actions necessary to provide enough confidence that a product or service will satisfy the given requirements for quality. Quality assurance covers all activities from design, development, production, installation, servicing and documentation. It includes the regulation of the quality of raw materials, assemblies, products and components, services related to production, and management, production, and inspection processes.

■ INTRODUCTORY NOTES

Today's demands for flexible and economic production of industrial sectors can only be met by automation solutions which are based on in-depth technological process modeling know-how, high-performance control systems and a comprehensive understanding of the logistics.

Production logistics is the term used for describing logistic processes within an industry. Also, the purpose of production logistics is to ensure that each equipment and technologies is being fed with the right product in the right quantity and quality at the right point in time.

Logistics activities are searching constantly for ways to improve process capabilities, shorten throughput times, improve quality, and cut costs. Many manufacturing and quality engineering books describe the specifics of defining process capabilities or optimally designing logistics systems. In many cases, the need for improvements may be obvious. In fact, to many private or public sector organizations, these improvements may be necessities.

The production logistics, as an important component of logistics systems in production companies, covers planning, management and monitoring of the material flow – from raw-material warehouses and various production stages to warehouses for finished goods. In the complete value cycle, production logistics follows procurement logistics and precedes distribution and reverse logistics.

The quality assurance research fields can be defined through the general research area, thought the different experiments effectuated in the laboratories, and, also, thought the modern calculation programs, optimization technologies and the better capitalization of the manufacturing data.

■ IMPROVING THE QUALITY IN INDUSTRIAL AREAS

Improving quality involves applying appropriate methods to close the deficiencies between current and expected levels of quality as defined by standards. This activity can use the quality management tools and principles to understand and address technical system deficiencies and improve the future technological processes. A range of quality improvement approaches exist, from individual problem solving, rapid team problem solving, and systematic team problem solving to process improvement and redesign and organizational restructuring or reengineering. The improving quality must include:

- *the approach to quality improvement*
- *the spectrum of quality improvement approaches*
- *the performance improvement*
- *analyses of efficiencies*

Quality improvement methodology has evolved over the years. Early quality assurance efforts assumed that improvements could be readily attained by adding new or more things, such as new machines, procedures, training, or supplies. It was believed that simply adding more resources or inputs would improve quality. People working to improve quality learned that increasing resources does not always ensure their efficient use and, consequently, may not lead to improvements in quality. In fact, in many cases, the quality can be improved by making changes into the systems without necessarily increasing resources. Interestingly, improving the processes not only creates better outcomes, but also reduces the cost of delivering services by eliminating waste, unnecessary work, and rework. Inspecting main activities or processes is another approach that managers have used to identify and solve problems. These methods tried to increase the control over the technological processes, in scope to avoid the eventually mistakes inefficient processes, or imperfections. The approaches can examine how activities can be changed for increase the performance. The role of approach is recognizes that both the resources (inputs) and activities carried out (processes) must be addressed together to ensure or improve the quality of products. The

methods which define the quality improvement are consisting in following steps:

- *identify, also determine what to improve;*
- *analyze, also understand the problem;*
- *develop, also hypothesize about what changes will improve the problem and develop solution strategy based on these changes;*
- *test and implement, also test the hypothesized solution.*

Figure 1. The Steps in the Quality Improvement

The quality improvement is not limited to carrying out these four steps, but rather emphasizes continuously looking for ways to further improve quality. When improvements in quality are achieved, teams can continue to strive for further improvements with the same problem or address other opportunities for improvement that have been identified.

1   Step one: Identify
The goal of the first step, identify, is to determine what to improve. This may involve a problem that needs a solution, an opportunity for improvement that requires definition or a process or system that needs to be improved. This first step involves recognizing an opportunity for improvement and then setting a goal to improve it.

2   Step two: Analyze
Once areas for quality improvement have been identified, the second step is to analyze what we need to know or understand about this opportunity for improvement before considering changes. The objectives of the analysis stage can be any combination of the following:

- *clarifying why the process or system produces the effect that we aim to change*
- *measuring the performance of the process or system that produces the effect*
- *formulating research questions, such as the following:*

To reach these objectives, this step requires the use of existing data or data collection. The extent to which data are needed depends on the quality

improvement approach chosen. Techniques to analyze problems include clarifying processes through flowcharts or cause-effect analyses, reviewing existing data, and, when needed, collecting additional data.

3   Step three: Develop

The third step, develop, uses the information accumulated from the previous steps to explore what changes would yield improvement. A hypothesis is formulated about which changes, interventions, or solutions would reduce the problem and thus improve the quality of products. A solution strategy is then developed based on this hypothesis. It is important to remember that at this point the hypothesis remains a theory, as it has not yet been tested. A hypothesis is a tentative assumption made in order to test its consequences. It is based on roll makers knowledge and beliefs about the likely causes and solutions of the problem.

4   Step four: Test and implement

This step, test and implement, builds on the first three. A hypothesis is tested to see if the proposed intervention or solution yields the expected improvement. Because interventions that prove to be effective may not yield immediate results, allowing time for change to occur is important in the testing process. The results of this test determine the next step, also the start the improvement process (if the proposed change did not produce an improvement), the modify the proposed change (if the proposed change yields improvement that is not completely satisfactory) or begin the implementation of the change or intervention (if the proposed change yields satisfactory improvement).

■ THE SPECTRUM OF QUALITY IMPROVEMENT APPROACHES

1   Rapid Team Problem Solving

Rapid team problem solving is an approach in which a series of small incremental changes in a system is tested—and possibly implemented—to improve quality. Like individual problem solving, this approach could be used in any setting, although it generally requires that teams have some experience in problem solving this approach quickly. Rapid team problem solving may involve cause analysis, but implemented in a less rigorous fashion than in systematic problem solving.

2   Systematic Team Problem Solving

Systematic team problem solving is often used for complex or recurring problems that require a detailed analysis. It frequently results in significant changes to a system or process. This approach is a detailed study of the causes of problems and then developing solutions accordingly. This detailed analysis usually involves data collection and therefore often requires considerable time and resources.

■ PROCESS IMPROVEMENT

The most complex of the four approaches, process improvement, involves a permanent team that continuously collects, monitors, and analyzes data to improve a key process over time. Process improvement is often used to assure the quality of important services in organization. Since this approach is often used to respond to core processes of a system, various stakeholders contribute to the analysis stage.

In sum, experience with quality improvement has rendered it a simpler, more robust methodology, and the application to a wide range of settings has become clearer. In all of these approaches, the methodology and principles remain unchanged, though their specific methods may vary.

■ ANALYZE, IMPROVE AND CONTROL

The data profiling, sometimes called data discovery or data quality analysis is the essential first step in any data improvement program. Data profiling provides a wealth of information about the integrity of the technical data specific for the processes and illuminates potential problems in the workflows. An effective data profiling approach allows structuring a data quality solution to address the specific nature of the data quality issues.

After identifying the data issues in the data profiling phase, it's time to begin correcting these issues. In the data quality phase, is necessary start to improve the quality of information throughout the enterprise by creating business rules to correct, standardize and validate the data. The high-quality data is essential to successful technical operations.

An effective data integration strategy can lower costs and improve productivity by ensuring the consistency, accuracy and reliability of data

across the enterprise. In this sense, ensuring the source data is consistent, accurate and reliable through a data quality process is the foundation for any successful business initiative.

After data quality establishes corporate standards for information and data integration creates a unified view, the enterprise (foundry) is ready to begin expanding on the value of its data and enriching its view of the specific customers, products and partners.

When the data enrichment is complete, the enterprise (foundry) has a unified, high-quality, and value-added view of its corporate data, and a solid base to make sound, informed business decisions. But the company will always be getting new data. Without the capability to maintain the integrity of that data, the benefits of all integrated system work start to disappear. Data monitoring builds on initial data quality and integration initiatives by providing the technology to examine data over time, enforce continued adherence to business rules, and prevent good data from going bad. Data monitoring helps you maintain consistent, accurate and reliable data.
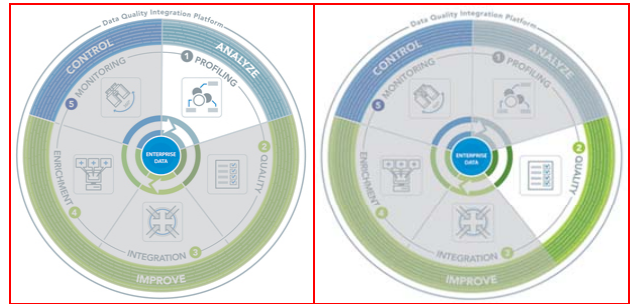

*Figure 2. Methodology for
a better enterprise data*

The entire methodology can built a better enterprise data and will make various analyze, improve and control data (Figure 2). This is achieved through five methodological building phases (stages – see Figure 3):

- Stage 1, also data profiling stage, also inspect data for errors, inconsistencies, redundancies and incomplete information
- Stage 2, data quality stage, also correct, standardize and verify data

- Stage 3, data integration stage, also match, merge or link data from a variety of disparate sources
- Stage 4, data enrichment stage, also enhance data using information from internal and external data sources
- Stage 5, also data monitoring stage, also check and control data integrity over time

Stage 1 - Data Profiling & Stage 2 - Data Quality

Stage 3 - Data Integration & Stage 4 - Enrichment

Stage 5 - Data Monitoring
Figure 3. The five methodological building stages

■ **CONCLUSION**

This methodology can helps any technical and technological analyze, can improve and can control data in the any enterprise area. The methodology provides the foundation to understand and improve the quality of data in any metallurgical organization. These mission-critical efforts require a complete, end-to-end approach to data quality. In this sense, the implementation of this methodology can help the general enterprise activity. We can enounce the following advantages:

- drastically reduce the time and resources required to find problematic data;
- catalog and analyze data and discover data relationships;
- discover the quality, characteristics and potential problems of information before beginning the processes;
- verify and validate data accuracy to improve the overall accuracy of customer records, product data and other information;
- ensure that high-quality information;
- enhance the value of product data with commodity coding and categorization details;
- detect when data exceeds pre-set limits.

Data monitoring has become a key component of a complete data-quality and data-integration practice, giving organizations the tools they need to understand how and when their data strays from its intended purpose. Monitoring also helps identify and correct these inefficiencies through automated, ongoing enforcement of customizable business rules. Data monitoring ensures that once data becomes consistent, accurate and reliable, it remains that way, giving confidence to professionals who make information-based decisions in any organization.

■ REFERENCES

[1.] KISS I., CIOATA, G.V., Improving the quality assurance. Methodology for a better enterprise data adapted for the rolling-mill rolls manufacturing area, Acta Technica Jaurinensis – Series Logistica, 1/2010

[2.] KISS I., ALEXA V., Some approaches on the integrated steel-making processes. Performance improvement of an existing steelmaking processes, Acta Technica Jaurinensis – Series Logistica, 1/2010

[3.] KOŠTÁL, PETER - VELÍŠEK, KAROL: Multifunctional production device. - ISI Proceedings, In: Annals of DAAAM and Proceedings of DAAAM Symposium. Vol. 15, No. 1 Annals of DAAAM for 2004 & Proceedings of the 15th International DAAAM Symposium "Intelligent Manufacturing & Automation: Globalisation - Technology - Men - Nature: 2004

[4.] MUDRIKOVÁ, ANDREA - KOŠTÁL, PETER - MATÚŠOVÁ, MIRIAM: Building of a production system program control laboratory, In: Annals of DAAAM and Proceedings of DAAAM Symposium. Vol. 20, No. 1 Annals of DAAAM for 2009 & Proceedings of the 20th international DAAAM symposium "Intelligent manufacturing & automation: Focus on theory, practice and education" 2009

[5.] NEMETH, P. TOTH, L. HARTVANYI, T., Adopting RFID in supply chains, Mechatronics, 2006 IEEE International Conference, pp. 263 - 266

[6.] TAMÁS HARTVÁNYI, LÁSZLÓ T. KÓCZY, PÉTER NÉMETH, LAJOS TÓTH, Architecture of Intelligent Intermodal Logistics Centres

[7.] HARTVANYI, T. KOCZY, L.T. TOTH, L., Applying intelligent methods in logistics control, Computational Cybernetics, 2005. ICCC 2005. IEEE 3rd International Conference, 71 - 74

[8.] COELLO, C., BECERRA, R.L. 2009. Evolutionary multi-objective optimization in materials science & engineering, Materials & Manufacturing Processes, 24/2, 119-129

[9.] WAKAMIYA, Y., NITTA, I. 2000. A quality control and diagnostic system for hot-rolling mills, Mitsubishi Electr. Adv., 30...33

[10.] WANG, X.D., YANG, Q., HE, A.R., WANG, R.Z. 2007. Comprehensive contour prediction model of work roll used in online strip shape control model during hot rolling, Ironmaking & Steelmaking, 34/4, 303-311

■ AUTHORS & AFFILIATION

1. IMRE KISS,
2. PÉTER KOŠŤÁL,
3. TAMÁS HARTVÁNYI,
4. JÁNOS NÉMETH,
5. GYÖRGY KOVÁCS

1. UNIVERSITY POLITEHNICA TIMISOARA, FACULTY OF ENGINEERING HUNEDOARA, DEPARTMENT OF ENGINEERING & MANAGEMENT, ROMANIA
2. SLOVAK UNIVERSITY OF TECHNOLOGY IN BRATISLAVA, FACULTY OF MATERIALS SCIENCE & TECHNOLOGY – TRNAVA, SLOVAKIA
3. SZÉCHENYI ISTVÁN UNIVERSITY IN GYŐR, DEPARTMENT OF LOGISTICS & FORWARDING, HUNGARY
4,5. UNIVERSITY OF MISKOLC, FACULTY OF MECHANICAL ENGINEERING AND INFORMATION SCIENCE – MISKOLC, HUNGARY