Case Study: Process Definitions – Process Measuring
How Does a Small Foundry Get Their ROI Off ISO/TS 16949:2002?

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ABSTRACT

Over the last five years, more and more companies have faced strict requirements from customers of achieving certification to numerous quality standards. The foundry industry receives the blunt of these requirements. As we tend to be described as “bottom of the food chain”, we face the hardest challenges of meeting QMS requirements. This paper will address how one foundry, a relatively small foundry in particular, has taking their QMS to the optimal level: earning a Return on Investment.

INTRODUCTION

Galesburg Castings, Inc. became certified to QS-9000:1998 / ISO 9002:1994 in July of 2000.¹ Since their initial audit, the company has faced many changes, from customer requirements, to a drastic change in the casting market, to new challenges of QMS revisions. This paper will outline the trials and tributes the foundry faced during their QMS updated from QS-9000 to ISO/TS 16949:2002, and describe the methods of determining their processes and measuring those processes.

Continual improvement is emphasized so dramatically within ISO 9001:2000 and the ISO/TS standards that Galesburg Castings chose to embrace those principles and improve their processes to counter-act the existing economy.

UNDERSTANDING PROCESSES

The task of understanding a process can not be taken lightly. Two parameters need to be fully understood before starting the definition task: Understanding what a process is and knowledge of the process being defined.

A process is defined as “a set of activities that transform inputs into outputs.”² An example of a foundry process could be mixing sand. The process of mixing sand requires many activities to occur. These activities could be operating the machine, performing the tests and monitoring the addition of additives. However, the input in mixing sand is none of those activities. The need to mix sand is the actual input.

Why? Because to have a reason to do something, their must be a need. So the need to mix sand is the input into the mixing sand process. Therefore, the output of the process is sand is mixed.

A simple diagram can be used to show this process (see Figure 1).
Creation of the process model satisfies the first parameter of defining a process: the understanding of the process.

As mentioned, many activities occur within this process, which leads to the second parameter: Knowledge of the process. Mixing Sand requires that many activities occur at defined intervals under controlled conditions. These activities are defined in the process model as controls and resources (see Figure 2). The activities include the implementation of inspections and criteria for the inspections. While inspection tells us if product is good or bad, it generally does not address the efficiency of the process.

Process efficiency measurements take into account how successful the process and associated activities perform as a whole, and if properly monitored, will assist in pinpoint which areas of the process are not achieving the desired result.

DEFINING THE PROCESS

Now that the process in understood, an actual definition of the process needs to occur. The purpose behind process definitions is to determine what the category of the process is and establish ownership, responsibility and authority. Processes have three main categories: Customer Oriented, Support Oriented and Management Oriented. Use of an “Octopus Model” can be one method to determine which category the processes fall in.

After the category is determined, use a turtle diagram to help establish the ownership, responsibility and authorities. Figure 3 shows a turtle diagram for the Product Realization Process. As the turtle shows, the input and output match as discussed in understanding processes. However, the diagram also list input requirements and output requirements. These requirements are the actual items that drive the process. The output requirements need to show the verity that the input requirements were met. This data does not necessarily show the evidence of how well the process works, just the results of the process.
The “Measurable” section of the turtle diagram establishes the exact method of measuring the processes. So for the product realization process, the direct performance of manufacturing and changes to manufacturing sectors are evaluated to determine effectiveness. As an example, if the customer specification requirements (input requirement) were not clearly communicated to the capability study team, which also reviews manufacturing requirements, the manufacturing sectors may have to modify the control plans. This could lead to the company not meeting customer specific requirements, producing the product at unacceptable capability levels or a more severe impact of taking the manufacturing line down.

This is why responsibility and authority needs to be defined. The organization needs to understand who has direct responsibility over the process; who can assist with support; who may be involved in the direct activities and what documentation and resources will be used.

If the turtle diagram is a honest picture of the process, and a company uses those diagrams to manage their business, they will continually have abilities to monitor processes and spear-head issues before a direct effect on bottom dollars can occur.

**Figure 2. A simple process model showing control and resources and measurables of a process.**
RETURN ON INVESTMENT

Owners of companies care about many things within their organizations: bottom dollar, employee costs, overhead costs, customers and customer satisfaction and employee environments. For those owners to guide the company in a direction that satisfies all those items, an old adage surfaces: What is the return on investment?

ISO/TS 16949:2002 tries to assist with answering that question through numerous avenues of its tedious requirements. Clause 8.4 says that analysis of data needs to occur to determine the suitability and effectiveness of the quality management system. While the requirement lists four specific areas: customer satisfaction, conformity to product requirements, characteristics and trends of processes and products including opportunities for improvement and suppliers, there is actually much, much more information that assists with the analysis.

The factual approach to decision making wants people to consider that effective decisions are based on the analysis of data. How the identified processes listed in the companies octopus models and the process definitions detailed in the turtle diagrams are used to manage the company, data regarding those processes, along with data from the listed QMS requirements will give owners actual living evidence of the direction of the company and clearly label where issues and “money pits” may exist.

Therefore, the direct return on investment of ISO/TS 16949:2002 for companies, and directly to Galesburg Castings, Inc. was the ability to identify the processes and start laying the brickwork needed to focus on specific company processes. Continual evaluation of the data by top management allows for the resources and guidance needed for the company to react and improve the processes.

Specific areas of Galesburg Castings, Inc. quality management system was the improvement of the customer communication process, by improving methods of receiving orders and communication of requirements to production personnel, a 2% increase on delivery was achieved.

Another area, the maintenance of equipment, was improved when identified that communication of maintenance needs was lacking, that inventory was uncontrolled and tracking of poor preventative maintenance was not available. After updating the entire maintenance process, the companies’ maintenance objectives were not only met, but reduced by over 20 lost production hours.

CONCLUSION

Understanding and defining processes are only beneficial if the people involved are educated on not only the purpose of these exercises, but on appropriate use of the tools. Process model diagrams, octopus diagrams and turtles are very effective tools, and many published books are available on proper implementation of those tools. This paper focused on one organization's use of the tools and the return on investment the implementation of the measurables identified within the diagrams. As company size depends directly on the ability to utilize and track processes, any organization should and needs to at least focus on those processes directly related to customers and customer satisfaction.
REFERENCES


² ISO 9000:2000, Quality Management Systems – Fundamentals and Vocabulary, pg. 10
**WHAT:**
Customer Prints
Purchase Orders

**WHO:**
Metallurgist
Casting Coordinator
List linkages/interfaces to involved parties:
Customer
Sales
Production

**INPUT:**
Need Process to Make Product
Input Requirements:
Customer Specifications
Manufacturing Requirements

**PROCESS:**
Product Realization Process
Steps/Activities
Cross Functional Team Meeting
Capability Studies

**OUTPUT:**
Have Process to Make Product
Output Requirement
Process FMEA
Established Capability Criteria
Evidence of Ability to Meet Specifications

**MEASURE:**
Minimal change to manufacturing requirements
Good manufacturing performance

**HOW:** (SUPPORT PROCESSES)
Sales – Customer Communication
Production – Manufacturing Processes
Top Management – Resources
Casting Coordinator – Competent People
Purchasing – Supplier Selection
Procedure/Control Documents
FMEA Form
Control Plans
Technical Specifications (customer & ASTM)

*Fig. 3. Turtle diagram for product realization process.*