ISO 9000, AN EASY METHOD TO DOCUMENT REQUIREMENTS

J. Martin O'Neill
Senior Consultant
HESTER Associates, Inc.
North Chatham, Massachusetts 02650

ABSTRACT
This paper provides a case study for upgrading documentation for an industrial, high volume manufacturer of consumer products to improve operating controls and meet ISO 9000 requirements in approximately one year.

ABOUT ISO 9000
The International Standards Organization published the ISO 9000 Series standards in 1987 after several years of collaboration with the 91 member countries. The United States was represented jointly by the American National Standards Institute (ANSI) and the American Society for Quality Control (ASQC). The ISO 9000 series is the first internationally accepted standard for quality systems. Acceptance has grown to well over 100 countries in 1993 representing most of the world’s industry.

The Europeans were first to established “Registrars” and begin registering companies for compliance to ISO 9000. This third party registration provided assurance to the customer that an effective quality system was being maintained and prevented the need for individual assessments by each of the companies customers. More than 40,000 companies are now registered in the UK alone. For the sale of many products, ISO 9000 registration is a purchase order requirement.

In early 1993 there were nearly 500 registered companies in the US and more than a dozen accredited Registrars. The registered US companies cite “improved operational and cost control” and “marketing advantage” as their primary reasons for registration. “Customer requirement” and “avoidance of direct customer audits” were less significant considerations.

ISO 9002 Quality Systems — Model for Quality Assurance in Production and Installation was selected for the European hand tool industry, recognizing the relative simplicity and maturity of the designs and the absence of installation or service contracts. The US hand tool industry is expected to follow.

BACKGROUND AND CULTURE
The Tool Division, which manufactures hand tools and hardware for the professional builder and homeowner, is a major contributor to the continued success of this Fortune 500 company with approximately two billion dollars in annual sales. It has a long, proud history for supplying high quality affordable hand tools starting with levels and rules in the mid-1800’s. The original plant still manufactures retractable rules and utility knives. There are now 14 additional plants in the US and one in Mexico. The plants are typically 150,000 sq. ft. and employ 250 people, of which about 10% are salaried. While there is minor duplication of capability, most products are focused in a single plant, i.e. screwdrivers, saws, wrenches, hammers and chisels are made in separate plants.

The employee culture includes a pride in the quality of the outgoing product. In the original plant the management backing of quality is evidenced by an imposing 50 foot long laser-interferometer for gauging the accuracy of scale printing equipment several times per shift. Employees brag about the accuracy of their products compared to offshore “imitations.”

The Tool Division growth over the years has resulted largely from acquisitions. Each of these takes time to assimilate the company culture, and three of the present plants are recent acquisitions in the initial stages of this process. It includes missionary work from Division Headquarters, transfer of selected plant activities to Division Headquarters, and selected transfer of personnel between plants.
The company has a solid and effective senior management, but the assimilation of new plants, the onslaught of foreign and domestic competition, and the impending imposition of quality system requirements by the customers has stretched them thin. Since ISO 9002 registration could probably be put off two to three years without any significant impact, it is to management's credit they choose to implement it earlier.

The manufacturing plants are isolated from the ultimate customers of the products by both the Tool Division warehouses, and the retailers. Retailing is increasingly done by fewer and larger companies such as Home Depot, K-Mart and Sears & Roebuck who are large enough to impose stringent price, delivery and quality requirements.

The Tool Division parent corporation has a tool plant in England which has been registered to ISO 9002 since late 1990. Since then, they have received multiple orders requiring registration, and they were required to refuse one significant order because a major subcontractor was not registered. While the U.S. companies may be three to five years behind European companies in adopting ISO 9002, this event in England caused concern and signaled opportunity for the Tool Division management. No other domestic tool maker is known to be committed to a program leading to ISO 9002 registration. Registration could not only prevent loss of future orders, but could be a way of differentiating the product favorably to the large retailers.

The manufacturing plants are decentralized for most functions. Plant operating budgets, product engineering, materials, quality assurance practice, financial reporting, and personnel are handled at each plant site with limited policy instruction from Division Headquarters. Functions retained at the Division Headquarters are limited to quality assurance policy, purchasing, packaging engineering, product testing (audit) laboratory, and financial control for capital expenditure. In addition, the Operating Committee which approves new and redesigned products includes managers from Division Headquarters.

The manufacturing plants are under-documented with respect to ISO 9002. It was interesting to note that the original plant had discarded an earlier system of documentation in the mid 1980's because it was overblown and cumbersome, and competitive pressures would no longer allow for the staff to maintain it. Many long term employees still followed their memory of the obsolete procedures in the absence of something new.

The Quality Assurance departments in the plants were found to be lean, and focused on inspection activities. The quality assurance managers were found to have earned their position from effective performance in other departments such as manufacturing, tool room and maintenance, or materials. Only one manager was found with MIL-Q-9858A experience, and that experience was 15 years old.

THE ISO 9000 PLAN

It was recognized that each of the plant quality assurance managers would require a thorough introduction to ISO 9002.

In the early summer of 1992, the Tool Division held a one week long program with the theme "Focus on the Customer". HESTER Associates, Inc., along with the Tool Division Quality Assurance Vice President provided training for the quality managers, including several from other divisions of the parent corporation. The Quality Assurance Manager from the registered plant in England attended. Recent experience with customers and their expectations were covered in significant detail. Quality planning and responding to customer expectations within the framework of an ISO 9002 quality system was a strong focus. Communication between the plants in the form of swapped procedures and techniques and other mutual assistance (such as for internal audit) was one of the goals.

It was decided that all plants should begin to develop their own plans for implementation and registration, but that Division Headquarters should be first. Considering the limited number of functions performed by Division Headquarters, the preparation and implementation would be relatively quick, and early registration would prevent the need for each registrar to separately assess Division Headquarters each time a plant was being assessed.

It was agreed that the original plant (and one of the largest) would be targeted for early registration. This was based on the convenience of the plant to Division Headquarters and the experience of many of the employees working with division procedures in the early 1980's. It was also considered desirable to provide a demonstration plant where personnel from any of the plants could visit and observe. This, along with the other devices of persuasion and inclusion in the annual goals of the appropriate managers, was thought to be sufficient to get the program underway. It was recognized from the beginning that competing priorities for deliveries and introduction of product innovations, installation cost, and a low awareness of the potential benefits in the plants would be obstacles.

Subsequent to the "Focus on the Customer" seminar, the Division CEO selected the higher priority plants for registration based on existing plans to sell products in Europe. Other plants were directed to "prepare" but no specific registration date was required.

THE EXECUTION

Interdepartmental teams were established for both the Division Headquarters and for the demonstration plant. A half day presentation on documentation was prepared by HESTER Associates, Inc. and delivered to each team. The team members each established goals for renovating the documents required by their department. The Division Headquarters Quality Specialist chaired each meeting and tracked the goals. He also fielded requests for assistance from team members, and on several occasions, HESTER Associates, Inc. was called in to provide one-on-one assistance.

Concurrent with the initial team meetings, plant visits were scheduled to the priority plants to perform an ISO 9002 gap analysis, form and indoctrinate the required documentation teams for the plants, and brief the plant management staff on the requirements. In some cases the ISO
9002 Management Representative was selected at this plant visit. Only about half the plants selected the plant QA manager as the Management Representative. It was assumed that the plant QA manager would have a key role in any case, and selecting another manager would provide additional "punch" to the program. In each case this plant visit was the shared effort of the Division Headquarters Quality Specialist and the author. These visits had a significant effect on reducing plant fear of the unknown. Even though ISO 9000 specification copies had been distributed, they were not read with understanding prior to the plant visits.

As the plant teams became active in documenting the quality system activities, both the training and the one-on-one assistance was provided as requested.

Training included topics such as the value of good documentation — consistency of activities, common understanding, training new people, management control, and common approaches to multiple plants to facilitate personnel transfers/audits. The hierarchy of documents was a common selection.

![Diagram](attachment:image)

The teams were encouraged to determine and flow chart existing practices, then verify and analyze them for the purpose of simplification. Flow charts and drafts of the simplified procedures would be submitted to the plant staff for discussion and agreement prior to the staff meetings each week.

Readability of documents was stressed. An eight point check list was suggested for procedures. It consisted of low fog index, upper and lower case, between two and six major headings, ample white space, active tense, consistency of terms, sketches and photos, and highlighted material.

To make procedures easy to use we developed a nine point check list. It consisted of narrow subjects (two page maximum), clear title, clear configuration, availability, clear scope and purpose, contact person identified, clean (protected) copy, specific references, and stated reasons for requirements. Where a form was required, "self-explanatory" was attempted. If instructions were necessary, they were put on the back of the form.

Procedures were also human engineered — easier to do the intended way than an alternate short cut. Even though it was not the intent to realign the work, an attempt was made to keep the procedures consistent with maintaining a motivated work force. In general this resulted from giving each employee an identifiable piece of work, some decision making authority for it and some feedback of results, preferably through the work itself. Approaching these goals was accomplished through feedback from the users. Some plants had formal employee involvement groups with regular meetings which accomplished this. However, the feedback was obtained, it was considered important to respond to it.

The registrar was selected by Division Headquarters. This was to prevent unnecessary duplication of effort and to secure a "package" deal to include the several plants where assessment dates could be predicted with sufficient accuracy. The registrar was picked from a short list of those with accreditation recognized by the International Conformity Assessment System. Division Headquarters funded the registrar's fees.

**RESULTS**

While each plant had its own personality, there were several deficiencies which occurred most often and required up to 18 months to correct. These are listed in the order of most frequent occurrence:

a) Documentation and Document Control

Many practices were simply not written down. Possibly because of the simplicity of many of the production operations, work instructions were minimal and there were no positive configuration controls. In virtually every plant we found hand written notes on work instructions which were not signed and dated, and no procedure to recognize who was authorized to alter these instructions. In spite of this, the employees had a high regard for the instructions available to them.

b) Training Program/Control

All the plants were doing some training, but none had a structured training program with established and documented requirements. None kept complete records of the training status of each employee. In some cases we found temporary employees assigned "just for tonight" to jobs they were clearly unqualified for.

c) Gauge Control

There was generally inadequate attention to the calibration status of production gauges, and lack of a suitable facility for a production worker to have a suspect gauge checked. The property management aspect of gauging was also neglected. There were frequently no company lists of gauges, and in some cases, no proof as to who owned the gauge, the company or the employee. More than one plant lacked back-up gauges for important applications.

d) Internal Audit

None of the plants had an internal audit program or any trained auditors. These programs were started from scratch.

e) Corrective Action System

The plants with the highest levels of rework had no closed
loop corrective action system. Other plants did not follow up to verify that corrective action was effective.

In each case the gap analysis team categorized the plant's performance in one of three categories:

1. The practice is acceptable and needs only documentation.
2. The practice needs improvement and then documentation.
3. A new practice is required, or the existing one needs a major overhaul, and then documentation.

The ISO 9002 standard has 18 paragraphs, and most plants had an equal percentage in each of the three categories. Schedules to eliminate the gaps extended from 6 to 18 months depending on available resources.

Each of the plants eliminated some obsolete forms and other unnecessary paperwork. Perhaps the most significant paperwork improvement was the review and reduction of product specifications from an average of 25 tests to 5. Many of the tests were called for during the product development phase years ago, but somehow remained on the specification. Many represented the designer's wish list, but were never achieved in practice. One handle strength test for hammers was found to have an acceptance limit at fourteen times the ANSI Standard. The actual product performed reliably at four times the ANSI Standard. The Division Headquarters had, in many cases, performed the tests for years, reported the results to the plant, and received no corrective action. The plants were busy with production schedules and product improvements, and considered the Division test reports to be just another hassle of life "we can't do much about". The Division is no longer doing unnecessary audit tests, and the plants now realize that the specifications will be changed on request.

Perhaps the most dramatic gain for the plants resulted from the application of corrective action systems. In one plant, the capacity of the plant was limited by the plating lines. The plant had suffered along with a 25% rework at plating for years, with significant stripping, small sub-lot handling, and late deliveries. The application of Pareto charting and a closed loop correction action for this situation revealed four significant causes of plating rework which occurred upstream of the plating line, and one which occurred at the plating line. Rework was reduced by 80%. The Manufacturing Vice President may now objectively consider investment in a new or additional plating line. The strip line is rarely operated, which has benefits in reduced hazardous waste in addition to rework labor.

One of the more intangible benefits of the program is an improved understanding and teamwork among the plant management's staff. It resulted from the reviews of new, simple written procedures on a weekly basis. The basic premises of rational management: hunting and gathering; assessing and clarifying; cause and effect; making choices; anticipating the future; problem and potential problem analysis, are all embodied in this process. Registrars find it refreshing to see that the entire plant management staff understands and follows the system, and for known reasons.

Other benefits include the reduced reliance on the long experience of employees due to clear and readable work instructions. Process and design changes are communicated more effectively and documents provide a valuable aid for training new personnel. The clear and simple organization of the documents reduces document maintenance from an impossible task to a reasonable one.

CONCLUSION
It is too early to assess the market benefit of being the first registered hand tool manufacturer in the U.S. There is no question that, with the registrations accomplished, and others continuing on schedule, the Tool Division's senior management feels more comfortable about having this ISO 9000 "ace in the hole." Even if a market benefit does not become obvious, the program is paying for itself in months, and has been achieved without the addition of any support personnel.

REFERENCES
Quality, "Selecting an ISO 9000 Registrar" Fig. 2, p. Q25, Hitchcock Publishing Co., Carol Stream, IL, August, 1992.