Geometrica Builds ISO 9001 QMS on Wiki

by Francisco "Pancho" Castaño, Gerardo "Gerry" Mendez, and Linda Day

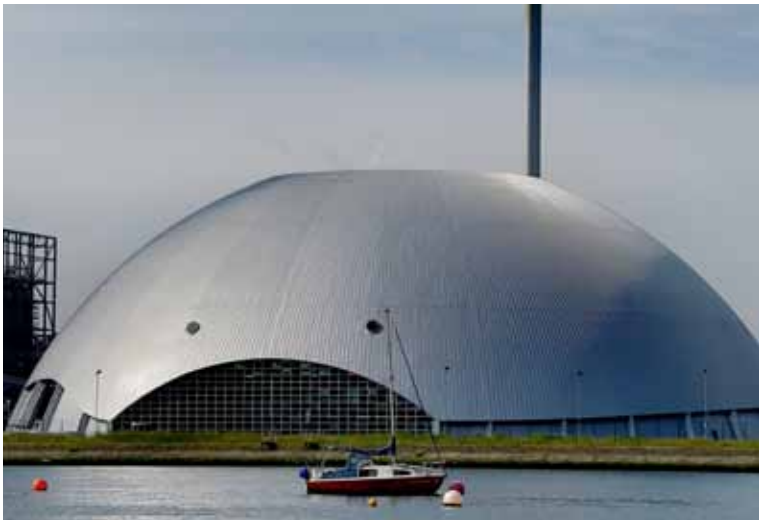
At a Glance …

- Geometrica, a manufacturer of domes and free-style structures, used a wiki to document its ISO 9001:2008 quality management system. The company attributes its fast track to certification—nine months from beginning to certification—to the ease and efficiency of wikis.
- While the original goal was meeting ISO 9001:2008 requirements, the wiki now functions as documentation of its integrated management system, including information sharing with external stakeholders, project and customer service management, and its certification to OHSAS 18001:2007.
- In its first nine months, the team amassed 1,577 pages of documentation, containing more than three gigabytes of data. Three years later, there are more than 10,000 pages servicing 67 internal users.

Geometrica designs and builds domes and space frames for architectural, industrial, and bulk storage structures around the world. Although the company was confident in its quality controls, clients were increasingly insistent on Geometrica attaining certification to ISO 9001:2008 Quality Management Systems – Requirements.

Documenting a quality management system (QMS) is an intensive feat for any organization, and Geometrica's experience was no exception. Before implementing the ISO 9001:2008 framework, several policies and procedures already were documented in various electronic and hard-copy formats, but these documents had been developed unsystematically to respond to problems, client demands, and training needs. Geometrica found it lacked a single approach and a cohesive structure.

The company's first attempt at documenting the QMS followed the conventional paradigm. Once the company decided to pursue ISO 9001:2008 registration, it formed a quality committee composed of the CEO, the vice president, the heads of operating departments, the quality manager, and an external consultant. After a gap analysis, the company intended to proceed in a sequential manner—preparing or completing documents for its vision, mission, quality objectives, and formal documentation procedures, followed by process descriptions, procedures, and work instructions.



Nominated by Partnerships Bulletin Awards as the Best Designed Project in the United Kingdom, the Marchwood "Silver Dome" is a leading example of best environmental practice and design for waste management in the United Kingdom. The Marchwood Energy Recovery Facility demonstrates Hampshire's pioneering approach to waste infrastructure and its farsighted waste-management strategy.

As the team emailed back and forth word-processed drafts, edits, comments, discussions, agreements, disagreements, meeting minutes, etc., it quickly became apparent that this approach was horrendously inefficient and the job momentous. Meetings dragged on to resolve even small wording differences. Even though at this stage there were only a few documents in the system, in some cases team members would not make desired edits because of the difficulties of keeping track of

Geometrica's structural system permitted simultaneous construction of this waste-to-energy plant and the elegant dome enclosing it in Hampshire, U.K. Geometrica's modular technology allows construction from the perimeter up. English steel decking covers the dome, supporting the breather membrane and the external aluminum cladding.

the latest version of a document while more than one person worked on it, or simply because of the effort required to update everyone's binder. The team attempted to solve the problem by maintaining only a single, master copy on the server and in hard copy, but even these were hard to keep in sync.

The letter and spirit of ISO 9001:2008—enabling a management system—was lost in the inbox. For Geometrica, which uses leading-edge technology in structural engineering and construction, it did not make sense to take a step back in time for a QMS. At this point, the company began exploring wikis.

About Geometrica

Geometrica has designed, manufactured, and installed domes and space frame structures since 1992. The company has developed unique technology to build long-span structures for architectural and industrial buildings. With facilities in Houston, TX, and Monterrey, Mexico, Geometrica supports its clients with a global network of representatives and has delivered domes and space frames in more than 25 countries.

The company's structures are used in sports venues, convention centers, houses of worship, offices, industrial plants, and domes for environmental protection. The construction is based on an advanced structural system, either in steel or aluminum, and covered in materials such as glass, wood, or metal.

What's a Wiki?

The wiki, which takes its name from the Hawaiian word for "fast," is a type of computer software that allows designated users to edit and link Web pages. The most famous wiki is Wikipedia, the popular online encyclopedia that has millions of contributing writers.

If your exposure to wikis has been limited to surfing Wikipedia, it may be difficult to appreciate the power that a wiki can bring to virtually every facet of documentation and management systems. A wiki allows anyone in the organization to edit content; and every change (including its author and time) is saved, with all related documents linked.

Achieving Buy-In

Geometrica began using a wiki to implement its QMS in May 2008.

Initially, some members of Geometrica's quality committee resisted using a wiki to document the QMS. They were concerned that the site would be vandalized, that the documents would be of poor editorial quality, and that, overall, control would diminish.

Objections rose from ingrained perceptions about the necessity of sequential document development (authoring, editing, approval, and finally publication) to ensure that when a document is published it is correct, complete, permanent, and authoritative. Another barrier was the idea that only the head of a department should modify documents that pertain to his or her work.

After the hesitant members test-drove the wiki, their objections quickly subsided. Geometrica found that a wiki's advantages stem from key paradigm shifts:

- Wiki documentation can be developed, corrected, and improved while working on the processes described, before or after flaws are found. This helps achieve congruence between the system and everyday activities, allowing documentation to remain fresh.
- A wiki is a collaborative environment that empowers everyone to take ownership of the process being described, the documentation under development, and the continuous improvement that is the goal of all quality systems. People new to wikis worry that their use will lead to chaos and poor documents, but the surprising fact is that wiki content continuously improves. Everyone wants to be at their best when their work is on display company-wide. Seeing small improvements accumulate is fun for everyone and it fosters teamwork.
- The ease of linking in a wiki creates a small-world network of documents, where relationships between documents are explicit and, through these relationships, nothing is more than two or three clicks away.

Implementation

Upper management expected Geometrica's ISO certification to happen swiftly, without slowing the work for its clients, and a wiki made that possible. While the wiki approach is not a magic bullet, as process readiness and careful preparation are also key to achieving compliance, use of this tool was an efficient way for Geometrica to document its QMS while avoiding bureaucracy that often plagues this process.

Though there are many wiki engines available, the most well-known is MediaWiki, which powers Wikipedia. Geometrica selected ProjectForum after considering criteria like ease of installation, maintenance, and use.

In addition to being fast, the wiki approach also aligned with the company's core values of teamwork, efficiency, and effectiveness. The quality committee empowered all of its members, and later the whole company, to edit any document. The distinction between author and editor disappeared, as changes to documents appeared immediately in all company locations, including Geometrica's headquarters in Houston, the plant and offices in Monterrey, and job sites as far away as Spain and the United Arab Emirates.

The quality of the information Geometrica captured improved and continues to develop with most edits, for many reasons:

- Ease of access means that users check the wiki frequently to learn more or verify their knowledge.
- More people get involved with much less effort. In the "old way," either noncore people aren't involved or, if they are involved, they spend large amounts of time in quality assurance process meetings that usually don't relate to their work. A wiki allows noncore people to pay attention to the parts they care about and are most relevant for them.
- Ease of editing simplifies "minor" corrections and improvements that otherwise might be ignored because the errors were "tolerable." Staff with expertise on a topic detect shortcomings and can correct them immediately.
- The aggregation of many small corrections and improvements produces very significant changes. Geometrica calls this "wiki magic."
- The ability to include and link to other wiki pages allows us to maintain information in a single location, which prevents unnecessary duplications. Note, however, that this requires careful oversight of the system (informally known as "wiki gnoming"), as there is no built-in mechanism to prevent repeated information.
- Incentives prompt positive cooperation of wiki users:
  - Every user works for Geometrica and is identified by name and password.
  - All changes to the wiki, as well as authors and times, are logged. The information is available to all through a page-history link, and to the administrator by user or date.
  - Changes to any or all documents may be monitored by any user through email or (RSS).
  - One rule: No rules. Anyone can share ideas, discuss, comment, change, edit, copy, and paste as needed, since the entire organization is working toward one goal. Everyone's skills and knowledge are welcome.
  - Reverting to prior versions of a document is easy and quick.
- As managers from different areas work together on wiki documentation, they create a multidisciplinary approach that enhances learning and interaction throughout the organization.

In Geometrica's implementation, the company used a database of corrective and preventive actions based on the open-source Bugzilla software. Originally developed to debug software, Bugzilla is also ideal for debugging documents, thereby complementing the wiki. Bugzilla helped capture the knowledge of individuals who would not normally contribute to the wiki, either because they do not use computers in their jobs or because they don't feel sufficiently confident about a change to make it directly on the wiki. Those individuals use the database to report nonconformities, which are then assigned automatically to process owners. The process owners then moderate structured, asynchronous discussions when required, discover root causes, and implement corrective and/or preventive actions directly on the system (per ISO 9001:2008 clause 8.5), but with hot-links to the affected documents for quick verification and audit.

The Geometrica dome at the Minera San Cristobal Mine in Bolivia, located at more than 4,000 meters above sea level in the Altiplano of the Andes Mountains, is composed of more than 88,000 galvanized steel tubes organized and inserted into aluminum hubs to form the structure. The Geometrica system requires no welding, as the prefabricated tubes slide easily into the aluminum hubs and hold fast. The precise yet simple assembly process allowed the mine to continue to operate during dome construction and made it easier to assemble the building in an environment subject to high winds.

During the first nine months, the Geometrica QMS wiki amassed 1,577 pages of high-quality documentation, containing more than three gigabytes of data. Three years later, Geometrica's documentation grew to more than 10,000 pages with 67 internal users. Computer tablets make the documentation available on the shop floor and construction sites.

The median user consults the QMS more than 20 times each day. The system continues to improve, with more than 500 edits each week.

Wiki Magic: Geometrica's Corrective and Preventive Actions (CAPA) Procedure

The history of the company's continuous improvement procedure illustrates the wiki process in a pleasantly recursive way. The images in Figure 1 are not intended to be readable, but show how the form and length of the procedure changes with time and "wiki magic."

A wiki page for this procedure was created May 21, 2008. By June 15, it was edited 15 times, and by October 8, 30 times.

***Figure 1**—Edits to the continuous improvement procedure*

June 15, 2008 • Edit no. 15

October 8, 2008 • Edit no. 30

October 29, 2008 • Edit no. 75

November 21, 2008 • Edit no. 121

December 3, 2008 • Edit no. 142

January 28, 2009 • Edit no. 150

Then, there was a furious spurt—112 additional edits during the following eight weeks for a total of 142 edits. This procedure is a living document and continues to evolve with the QMS, averaging nearly two edits each week. But, as we experienced early on, edits are clustered around instances of significant change in the system.

A Closer Look at Compliance

The following areas of ISO 9001:2008 compliance illustrate the value of the wiki approach:

Documentation of the Quality System

4.2.1. The wiki allows all documents to be stored in a place where everyone can view and review them.

Control of Documents

4.2.3. The wiki navigation, linking, and search capabilities keep documents truly available, at points of use, for both consultation and editing. This encourages everyone to keep documents live and up-to-date. Automatic notifications of changes ensure prompt review by process owners. Current revisions can be identified easily because they are displayed immediately. But all prior versions—and comparisons to the current version—are just a couple of clicks away.

Control of Records

4.2.4. Records are easily controlled, stored, retrieved, and retained—and there is no need to dispose of them. Typing information directly into the wiki's pages (or scanning and uploading it) saves space and archives information in such an easy-to-find manner that there's no point in printing or copying. Even though anyone can access and modify wiki information, records are safe because prior versions are saved automatically.

Management Commitment

5.1. a) The wiki allows management to communicate customer, statutory, and regulatory requirements throughout the whole organization very quickly. As soon as the manager finishes typing, the wiki emails notifications of the change to everyone who needs to know. This enhances customer focus, because customer demands are immediately cascaded to the correct organizational levels (5.2).

Quality Policy

5.3. d) The wiki communicates policy to the members of the organization, as well as allows anyone within it to check or change it. Thus the wiki promotes reviews and continuing suitability.

Quality Objectives

5.4.2. The wiki helps maintain the integrity of the quality-management system. When a document is revised in a conventional system (paper- or server-based), related documents usually also must be revised to ensure that a change in one is reflected in the other. The wiki does this automatically. Even document name changes are updated throughout.

Responsibility and Authority

5.5.1. The wiki helps ensure that all responsibilities are communicated. Posting an organizational chart in the wiki allows instant access to roles and responsibilities.

Internal Communication

5.5.3. In an era of "open doors," a wiki is a social tool, where internal communication is natural and crowd-sourced.

Management Review

5.6. The wiki simplifies and enhances management review. The standard requires inputs to be presented, outputs to be derived, and both to be recorded. Here's how to accomplish this with a wiki:

- Prepare the review on the wiki, posting all inputs (and their graphs) in the wiki, as well as the order of the day.
- During the meeting, take notes and post them beneath the graph pictures in the page described as the record of the meeting.
- Log requests for corrective action and links from the management-review record.
- Post a small summary of findings.
- Log attendance and concurrence by each attendee.

Competence, Training, and Awareness

6.2.2. All competence reviews, from employee evaluations to their comparison with needed competencies, can be recorded in the wiki and isolated in a page protected by password access (for confidential information). Employee activities and allotted times also can be maintained in this area, along with records of all grades in training classes. This makes planning for follow-up courses very easy.

Design and Development

7.3. The wiki helps manage design-development planning, inputs, outputs, review, verification and validation, and change control. Using the wiki, a team can brainstorm ideas, process information, review output, and present feedback for verification and validation. A process that previously might have been reviewed by only one or two people can be reviewed and commented upon by the whole team, with no need to pass papers or send personal emails.

Control of Production and Service Provision

7.5.1. The wiki helps control production. Using the wiki, all records and work instructions can be carried out online, updated easily, and printed (if needed) in the production plant. Plant personnel access current documents with their tablet computers.

Internal Audit

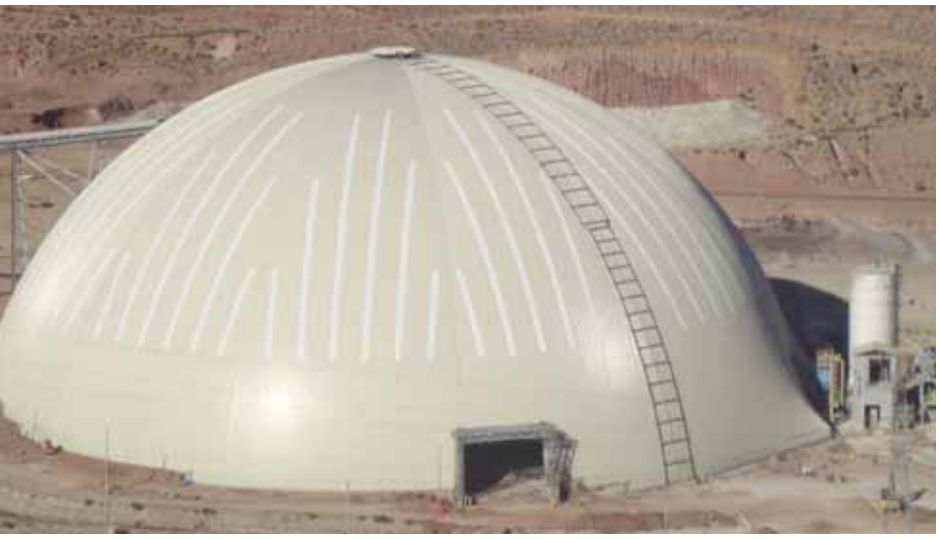
8.2.2. The wiki simplifies internal audits. In a wiki you can plan audits, fill in the forms, print them, sign them, and scan the documents, all in a matter of minutes. The wiki eliminates the need to print a document, write comments on it, clean it up, type it again, and print it out again. The wiki also stores signed audits; it's easy to keep all records in one "cyber place," where everyone can access them through their computers.

Improvement

8.5. The wiki promotes continuous improvement, including both corrective and preventive actions. The combination of Bugzilla and wiki allows Geometrica to pinpoint areas for improvement. With the wiki, documents appear to self-correct, since typos spotted by any user can be corrected immediately. Any change initiates an immediate email to the person responsible for the document, alerting him or her to the change. More significant changes go through the Bugzilla CAPA system, improving both documents and the processes themselves.

Results

Geometrica received ISO 9001:2008 certification from BSI in February 2009—nine months after employing a wiki—and has been successfully recertified since then.



To protect workers, the environment, and neighboring communities, the Minera San Cristobal Mine in Bolivia sought a solution to prevent the release of dust from its stockpile and protect the material awaiting transport to the mine's ore processing facility. The finished stockpile containment structure is a Geometrica dome 140 meters in diameter and 59 meters in height, anchored by a concrete foundation—the largest dome of its kind in South America. The foundation, which accommodates a 9-meter change in elevation covering 140 meters, is fitted to the terrain and is designed to withstand wind speeds of up to 150 kilometers per hour and an ice load of 110 kilograms per square meter.

The original goal was to document a minimal quality management system that met ISO 9001:2008 requirements. As the company realized the efficiency of using a wiki, the goal became to document all processes, including those not directly related to quality: marketing, finance, human resources, and more. Since then, Geometrica's wiki has grown to encompass an integrated management system with the inclusion of its project management and customer service processes and its certification to OHSAS 18001:2007—Occupational health and safety management systems in August 2011. Use of the wiki has also expanded to manage information sharing with clients, suppliers, and potential clients.

The wiki enabled Geometrica to gain a system centered on the organization, and the documentation is representative of what the organization needs—not what one individual or department believes to be the best. This was an organization-wide effort, as everyone was empowered to provide feedback and shape the documentation to balance personal belief or subjectivity.

Geometrica's wiki use earned the company finalist honors in the small-company category for the 2010 Carl E. Nelson Best Practices Award competition, which was established to recognize excellence in the enterprise content management field.

Conclusion

The business world is so different from that in which quality systems evolved decades ago. Today, we exist as a global village. We rely on cheap transportation and effective supply chains rather than economies of scale. We cross the world in hours and close business deals from China to Chile in seconds. Networks and telecommunications tie it all together. Geometrica felt the natural base for its quality system is those technologies.

The bottom line is that a wiki simplifies compliance to ISO 9001:2008 by embracing collaboration and maintaining well-organized documentation, which is the basis of knowledge management. The wiki approach won't provide an instant solution for organizations that aren't ready for certification. But for organizations that recognize that their documentation is "a tool," a wiki can help take the emphasis off the technical systems and formats and place it on the content, collaboration, and key business processes. All of the know-how of the

organization resides in a medium where it is stored, improved, protected from vandalism, and can be used for education and training. With the benefits that wiki technology provides, it's only a matter of time before more quality and management practitioners adopt this powerful technology.

About This Case Study

After Geometrica attained ISO 9001:2008 certification in 2009, it wrote—and improved—this case study on a wiki. Visit Geometrica's "living" case study at http://articles.geometrica.com/1581.html.

For More Information

- Contact Patricia Paddy at paddy.p@geometrica.com.
- Visit Geometrica's website at http://www.geometrica.com/.
- Read more case studies published by the ASQ Knowledge Center at http://www.asq.org/media-room/case-studies/case-for-quality.html.
- More resources about getting started with management system standards are available in Standards Central at http://asq.org/standards/.

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About the Authors

Francisco "Pancho" Castaño, P.E., is the CEO of Geometrica and has taken the company from its start in 1992 to its present world-leading position as a supplier of domes and space frames. Castaño led the engineering for the record-breaking Nemak free domes. He holds several patents, an MBA from the University of Michigan, a master's degree in civil engineering from the University of Waterloo, and a civil engineering degree from the Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM). He chairs Geometrica's board of directors and assembled its current operating team.

Gerardo "Gerry" Mendez is the CFO of Geometrica and an industrial engineer. He holds a master's degree in administration from ITESM. He coordinates efforts to maintain the company's ISO and OHSAS certifications, as well as develops new business for Geometrica with print and electronic media.

Linda Day is the principal at Day Creative. Day Creative focuses on B2B marketing communications for energy, petrochemical, computer, and other technical industries. She holds a bachelor's and master's degree in chemistry and biology from Rice University and a bachelor's in fine art from the University of Houston.