



September 2010



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Are Large Amendments Needed for Our Rotating Equipment Specifications?

By Fred K. Geitner, P. Eng.

I heard the complaints of several technical managers of an EPC (Engineering, Procurement, Construction) company. They were complaining about the proliferation of voluminous technical specifications for rotating equipment: reams and reams of paper in addition to commonly used industry standards. They felt that there were frequent duplications and contradictions in such specifications, frustrating them or the vendors, and causing costly delays. While these specific complaints were directed towards rotating equipment specifications, especially for compressors, the same can often be said for other equipment specifications (e.g., pressure vessels, heat exchangers, storage tanks, etc.).

In an effort to capture the accumulated knowledge and experience of equipment end-users and manufacturers, the American Petroleum Institute (API) developed a series of engineering standards which, since the mid 1950s, have found widespread acceptance both in the United States and worldwide. The primary purpose of API standards for rotating equipment is to establish minimum mechanical requirements. This limitation in scope is consistent with API's overall charter.

At first, not every purchaser understood that API standards required the purchaser to specify certain details and features. Experienced users of critical machinery had been doing just that. They were modifying, deleting, amplifying, and adding to API rotating equipment standards to reflect their particular operating or maintenance experience and preferences, and to ensure that the machine had the desired degree of reliability, maintainability, accessibility, inspectability and thus, availability for its specific application. They supplemented API standards with specification addenda or amendments according to Table 1. Note that the respective needs of both purchaser and manufacturer were, and still are, best served by supplementing a given API standard, rather than by rewriting it or incorporating sections from it into another complete technical specification. To do otherwise needlessly increases the number of pages that must be read by all parties and increases the possibility of errors.

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safety in process design and relief system design for a client in Latin America. The course was very well received and follow-up activities related to process safety are anticipated.

Now it seems that this effort has gone too far. We would like to make the point that API rotating equipment standards have reached a mature level based on experience gained over many years. After all, we are looking at the Seventh Edition of, for example, API 617, *Axial and Centrifugal Compressors and Expander-Compressors for Petroleum, Chemical and Gas Industry Services*, and even the Tenth Edition of API 610. This begs the question: Is it really still necessary to expand these standards to sometimes double their size by amending them as described above?

As we look around, we find that larger end-user companies seem to get along with a minimum of amendments to the API standards. The only additions generally seem to be related to site safety, environmental impact, or reliability driven improvements. These are typically covered in a one or two page document. The rest of the technical specification basically just follows the API standard.

While I want to encourage readers to curtail the business of modifications and additions, I nevertheless realize that there is still a good deal to be accomplished by a knowledgeable and experienced specifying engineer. Two points need to be mentioned:

- API standards ask the user to make decisions in response to clauses marked with bullets (●). These clauses usually begin with "When specified ..." and require a thorough understanding of the standard. The specifying engineer should conscientiously address each of these decision items and not leave the decision to the vendor or somebody else. A case in point would be a "bullet clause" in API 618 dealing with piston rod coatings. Here the specifying engineer would supplement the standard by invoking the purchaser's piston rod coating upgrading specification developed by their maintenance-engineering group. Where such technical inventory does not exist in-house, the question of rod coatings should be thoroughly discussed with the vendor or a consultant before a decision is made.
- There are still opportunities for standard enhancement. It is not within the scope of this article to comment on the many paragraphs in typical API or other industry standards to show where such enhancements would be appropriate and cost effective. However, one example will illustrate the point. Figure 1, depicting a typical API-type compressor lube oil reservoir, should be examined by the specifying engineer. He or she would probably realize that for better heat transfer and reduced corrosion risk, the steam-heater cavity at the reservoir bottom should be filled with a heat-transfer oil or perhaps discarded lube oil.

A separate filler standpipe and breather cap should be provided. If an electric heater is used, it should be located in the steam-heater cavity at the reservoir bottom, as long as the cavity is filled with heat-transfer oil or discarded lube oil. This will reduce the risk of lube oil deterioration from prolonged contact with an excessively hot heater cartridge. Of course, the specifying engineer would also notice that several plugged connections are not dimensioned and, accordingly, would specify a reasonable size to cover contingencies.

So what are we trying to say? I recommend that technical management start looking at specification volumes with the objective of reducing them to the point where an awareness exists that every single modification (see Table 1) of an existing industrial standard should require some cost-benefit driven justification. All specification packages should comply with the essential elements of good specifications, namely:

- Precision
- Brevity
- Completeness
- Encouragement to the vendor (OEM) to propose, but not automatically execute, what he considers to be "state-of-the-art" advances.

References:

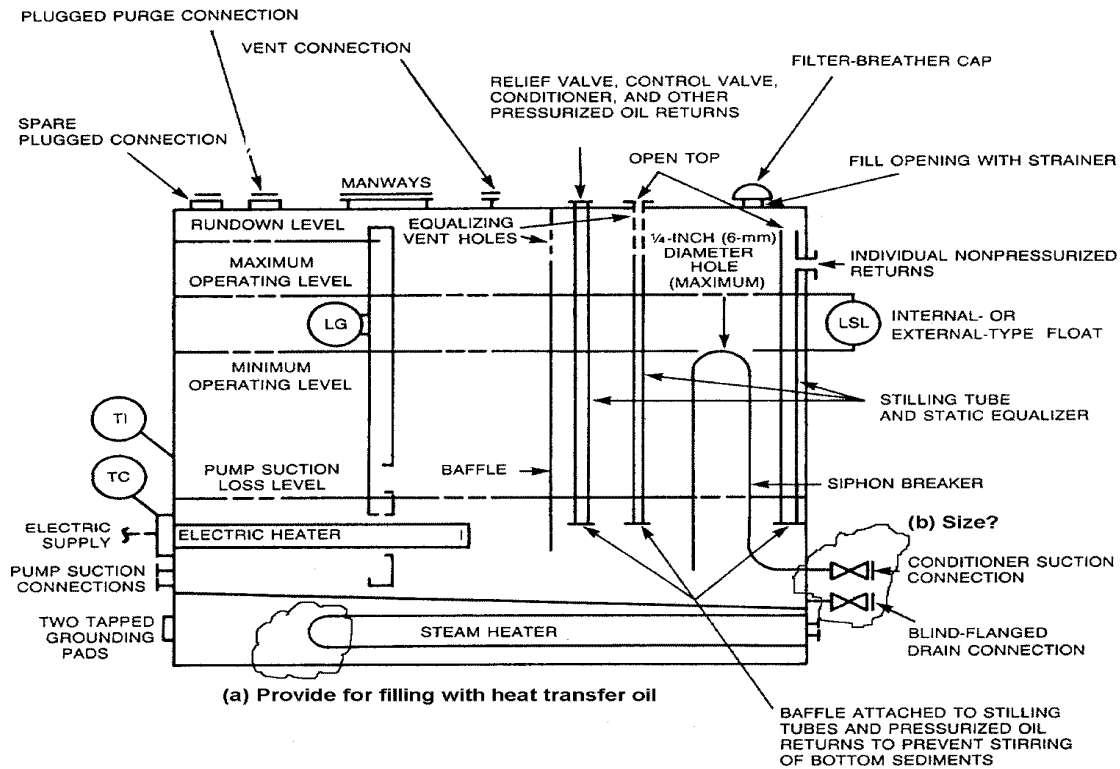
- API 617, *Axial and Centrifugal Compressors and Expander Compressors for Petroleum, Chemical and Gas Industry Services*
- API 610, *Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries*
- API 618, *Reciprocating Compressors for Petroleum, Chemical, and Gas Industry Services*
- Pipeline and Gas Technology Magazine, March 2007



Table 1 - Nomenclature for Standard Modifications

| Heading | Action |
|---------------------------|---|
| Decision | A decision has been made by the owner, as required by the corresponding paragraph in the governing API Standard or other applicable Industry Standard. |
| Exception | The owner disagrees with part of the content of the corresponding paragraph in the governing API Standard. |
| Substitution | The content in the paragraph referred to replaces the corresponding paragraph in the governing API Standard. |
| Modification | Revision , by rewording or additional information, to the corresponding paragraph of the governing API Standard. |
| Addition | A new paragraph or section, which does not exist in the governing API Standard, has been added . |
| Specification Requirement | Identifies that action is required by the specifier or requisitioner, in completing the data sheets. |
| Engineering Requirement | Establishes the expectation that the party specifying and purchasing the equipment for the owner will take the necessary action, to ensure resolution of the engineering issue identified, either for the specification and data sheets, or during the design and manufacturing of the equipment. |

Figure 1 - Typical API-Type Compressor Lube Oil Reservoir



Fred Geitner has over 40 years of experience in the design, maintenance, operation, and troubleshooting of machinery used in process plant and transmission pipeline applications. Please contact Vince Carucci (vcarucci@carmagen.com) if you'd like more information on Carmagen's expertise in this area.

