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### The Revised API 682 Mechanical Seal Standard

The 4th Edition includes details on the revised product coding system, the seal system selection process and seal supply systems.

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After nearly six years of intensive work, the American Petroleum Institute (API) 682 mechanical seal standard is soon to be adopted. Since its introduction in 1994, API 682 has become "the" standard that sets the global tone for the procurement and operation of seal and supply systems for centrifugal pumps in the oil and gas sector as well as in the petrochemical industry. API 682 is a "living" standard that directly incorporates diverse practical experience in its regular updates.

Founded in 1919 and located in Washington, D.C., the API includes close to 500 companies from the oil and gas sector and the petrochemical industry. Since 1924, it has focused on technical standards. To this day, API has adopted roughly 500 standards that address diverse processes and components in detail—which ultimately ensure a maximum of operating and process reliability. API standards, which are clearly defined and in part attached to approval tests, do not take effect only in the U.S. In many cases, they have developed into worldwide industrial standards. API is often considered a synonym for safety and reliability.

Individual standards—including API 682 regulations for mechanical seals and seal supply systems—have become so popular that they have even been referenced in outside industry applications. The authors of the new edition point out that this was never the intention and clarify the actual purpose of the API 682 standards. The standards are for seal systems in pumps—not in agitators or compressors—and for oil and gas and petro chemistry—not for water supply or the food sector.

#### PI 682 History

Initial information about mechanical seals was originally provided in the API 610 pump standard. During the 1990s, API 682 developed into a separate, more comprehensive standard for mechanical seals and supply systems. The API 682 standard is continually maintained and updated by end users and manufacturers. Another quality of API 682 is that it does not typically permit only a single technical solution. In addition to proven and tested standard solutions (defaults), the regulations also deliberately list alternatives (options) and even allow customized solutions (engineered solutions). This diversity is demonstrated more clearly in this edition than in previous ones.

The composition of the 25-member task force is representative of the practical way in which API approaches the topic of seals. Since 2006, the task force has been updating the 3rd Edition of API 682 that took effect in 2004 and is still valid. In addition to leading seal system manufacturers, the American-European expert panel—which intentionally counted on non-API member collaboration—also included renowned planning companies and representatives from some of the largest mineral oil groups, who are users of seal solutions.

#### Checked and Tested Safety

While the currently valid API 682 edition included approximately 200 pages, the 4th Edition is 260 pages. The revised edition is organized into a body of text with 11 chapters and detailed annexes with a significantly expanded scope. For example, Annex 1 provides detailed information on more than 20 pages for API-conform seal qualification tests.

Default seals and options must be tested using five different media and clearly defined operating conditions representative of typical API applications. Together with the described seal designs, this yields a high number of possible test variations. In the process, the expended time per test and seal type can take up to 200 hours. The result for typical industry seal designs is documented in a test certificate and a detailed report. Customer-specific qualification tests can be agreed upon for engineered seals.

Essentially, checked and tested product safety is the core of the standard. The objective of API 682 is continuous operation of at least three years (25,000 operating hours subject to the legally stipulated emission values, or for maximum "screening value" of 1,000 parts per million by volume, EPA Method 21), increased operational reliability and simplified maintenance. The standards defined by API apply exclusively to cartridge systems with a shaft diameter of 20 to 110 millimeters and a defined range of operating conditions.

#### Coding System

The 4th Edition also includes the revised product coding system (Annex D). The proven classification parameters "Category," "Arrangement" and "Type" will be continued. They are listed first in the revised code and provide information about the setup and field of use of the respective API seal. The seal arrangement includes:

- Arrangement 1—single seals are differentiated
- Arrangements 2 and 3—double seals with and without pressurization



Details regarding the supply system—specified as "Plan"—are in the old and new code. The addition of precise information regarding material selection and shaft diameter is new. This gives more meaning to the code and guarantees a clear specification of the mechanical seal and its operation—from selection to documentation. Industry experts agreed that the expanded coding system will prove itself in practice and endure permanently.

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When sealing aggressive and abrasive crude oil in pipelines, reliability and extended service intervals are required. Challenging conditions place high demands on the design limits of sealing and supply systems, which can handle frequent stops/starts and occasional pressure reversals or reverse pump rotation.

**More Precision During Selection**

The selection process of an API seal system is complicated. Several flow charts and tables on more than 10 pages are dedicated to this topic in the new edition. To provide more precision in the technical selection process when determining the arrangement, an alternative selection tool (Annex A.4) has been included in the 4th Edition for the first time. This method is based on the established "Risk & Hazard Code" and has been tested in practice.

The starting point is the pumped medium. Its real hazard potential is accurately recorded and described by the "Hazard & Risk Code" in the "Material Safety Data Sheets." Decisions can be made quickly and securely, for example,

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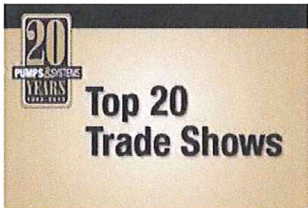
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