



ISO/TC 192
Gas turbines

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STRATEGIC BUSINESS PLAN 2019

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STRATEGIC BUSINESS PLAN ISO/TC 192, EXECUTIVE SUMMARY

For 60+ years, Gas Turbine machines have provided electrical power, mechanical power, etc. which has enabled new and innovative technologies to propel and shape societies globally. The fundamental operation of a gas turbine is to convert gas and/or liquid fuel by combustion into rotating mechanical force for generating electrical energy or mechanical driven equipment.

To understand the magnitude of the power industry to which the Gas Turbine provides core stability and reliability, in 2017, there are approximately 1 B people globally that are without power and another 1.3 B people that do not have reliable power. In 10 years, it is estimated that there will be 1 B more people that will need power and will require \$124 Trillion USD to support this growth. In parallel, there is an exponential increase in user demand globally to support growing markets and infrastructure, manufacturing, and new consumer technologies such as electric vehicles, electronics, etc. To meet this demand, other sources of power such as solar, wind, tidal, and storage technology in combination with Gas Turbines will support market needs. Gas Turbines and Gas Turbine driven combined cycles have enough flexibility to compensate for the fluctuations of solar, wind, tidal, etc. energy productions.

Even though renewable energy technologies assert that they are more environmentally friendly, today's Gas Turbine technology is also delivering fast electrical and mechanical power more efficiently with lower environmental impact, high reliability, and safety globally. Gas turbine sizes and uses are more versatile today including fast, on demand start up capability and can support centralized and localized applications using a variety of waste and renewable fuel sources.

Historically, the Gas Turbine industry has been more predictably cyclic and has been traditionally impacted by politics, financial lending, sources of capital, fuel availability, and environmental considerations. Globally gas turbines have historically been the backbone of the power, processing, etc., today gas turbines have moved into a supportive role to provide stability in a diverse mix of other distributed resources.

In recent years, large scale Gas Turbine have been severely impacted by several new disruptions making it a much more volatile, less predictable, and more challenging market. It has also increased the scope, application, and growth of medium to small gas turbines. However, in some markets like the Middle Eastern market, projects with increase natural gas consumption are still required. Markets are driving increased fuel efficiency improvements and reliability to meet specific application requirements, such as desalination.

In contrast, there are still some very compelling factors that are continuing to promote the need and growth of Gas Turbines such as the shale gas boom; decrease in nuclear power in some regions; the general increase in demand for reliable power and or heat due to the internet and many other electricity using technologies like mobile phones, computers, and more investments in upgrading machinery to be highly efficiency and low carbon emission. <https://globenewswire.com/newsrelease/2017/04/03/953391/0/en/Industrial-Gas-Turbine-Market-worth-18bn-by-2024-GlobalMarket-Insights-Inc.html>.

Gas Turbines and their accessories are very complex and require a multi-disciplinary network of experts to develop standards that support this technology. ISO TC 192 has the role to prepare standards to support this industry and promote global innovation, market acceptance, and safety across the lifecycle to meet stakeholder needs. ISO TC 192 actively maintains 20+ standards relating to procurement, performance, and safety. The committee is currently focused on improving existing safety and procurement standards to be more internationally relevant and recognition of fundamental machinery principles and standards.

1. INTRODUCTION

1.1 ISO technical committees and business planning

The extension of formal business planning to ISO Technical Committees (ISO/TCs) is an important measure which forms part of a major review of business. The aim is to align the ISO work program with expressed business environment needs and trends and to allow ISO/TCs to prioritize among different projects, to identify the benefits expected from the availability of International Standards, and to ensure adequate resources for projects throughout their development.

1.2 International standardization and the role of ISO

The foremost aim of international standardization is to facilitate the exchange of goods and services through the elimination of technical barriers to trade.

Three bodies are responsible for the planning, development and adoption of International Standards: ISO (International Organization for Standardization) is responsible for all sectors excluding Electrotechnical, which is the responsibility of IEC (International Electrotechnical Committee), and most of the Telecommunications Technologies, which are largely the responsibility of ITU (International Telecommunication Union).

ISO is a legal association, the members of which are the National Standards Bodies (NSBs) of some 164 countries (organizations representing social and economic interests at the international level), supported by a Central Secretariat based in Geneva, Switzerland.

The principal deliverable of ISO is the International Standard.

An International Standard embodies the essential principles of global openness and transparency, consensus and technical coherence. These are safeguarded through its development in an ISO Technical Committee or Sub Committee (ISO/TC/SC), representative of all interested parties, supported by a public comment phase (the ISO Technical Enquiry). ISO and its Technical Committees are also able to offer the ISO Technical Specification (ISO/TS), the ISO Public Available Specification (ISO/PAS) and the ISO Technical Report (ISO/TR) as solutions to market needs. These ISO products represent lower levels of consensus and have therefore not the same status as an International Standard.

ISO offers also the International Workshop Agreement (IWA) as a deliverable which aims to bridge the gap between the activities of consortia and the formal process of standardization represented by ISO and its national members. An important distinction is that the IWA is developed by ISO workshops and fora, comprising only participants with direct interest, and so it is not accorded the status of an International Standard.

2. BUSINESS ENVIRONMENT OF THE ISO/TC

2.1 Description of the Business Environment

During the past 60+ years, gas turbine power plants have become the leading form of electric power generation. Although the business tends to be cyclical, on average the industry has profited well from the sales and service of gas turbine equipment. Rapid advances in technology have led to improved performance, efficiency, reliability and lower exhaust emissions, while providing the lowest cost per kilowatt installed cost. The Gas Turbine is a part of the overall renewable energy solution.

There are several wide areas of application for gas turbines. The largest area of electric power generation application is with turbines typically rated above 80 MW and up to 500 MW or larger. For industrial applications, which include both electric power and compressor drives, the units are generally in the 5 to 70 MW. For emergency power in buildings, hospitals, and other business complexes, there are many turbines installed with rating of 30 kW to 5 MW.

At least half of the applications involve some form of heat recovery in the gas turbine exhaust, which is usually steam generation (combined cycles). This boosts the overall plant efficiency by 50% and expands the market to include steam generators and steam turbines. The most efficient gas turbine combined cycle is now rated at 60%+ and cogeneration +85%, comparing to 46% efficiency for the best steam plant.

Principal stakeholders in the industry are the manufacturers of the gas turbines, those associated with Long Term Service Agreements, suppliers, purchasers, owners/users, operators, engineering/constructor/assemblers, service providers, system designers, regulators, and third-party testing, inspection, and certification bodies. TC 192 encourages the engagement, participation, and input from all stakeholders.

The technical complexity and sophistication of gas turbines, while instrumental in achieving the advantages mentioned above, do present some challenges that TC 192 has addressed and will continue to address. Among these are test procedures, systems safety, condition monitoring, sound and exhaust emissions, and procurements standards.

2.2 Quantitative Indicators of the Business Environment

The market for gas turbine power is significant and is expected to remain as such for the foreseeable future. Estimating forecasts, demands, and how the gas turbine will play in the market is continually changing as the renewable landscape evolves.

There are about 4 OEM suppliers that support the large machine market and approximately 10 OEM's that support medium to smaller units to market. There are a plethora of service and aftermarket suppliers which can provide parts, upgrades, part repairs, overhauls, etc.

Currently the most significant market is expected to be in developing regions such as Africa, the Middle East, and the Asia-Pacific region. Strong demand will continue in more established and mature markets such as North America where renewable energy penetration presents the need for predicable power generation technology like Gas Turbines to stabilize grid power.

3. BENEFITS EXPECTED FROM THE WORK OF THE ISO/TC/SC

The main benefits for stakeholders are to provide the world guidance on safety, design, manufacturing, testing, installation, operation, and purchasing practices to help improve global access. Additionally, the standards developed by TC 192 also provides valuable educational benefits by establishing a core level of understanding of the technology, uses, calculation examples, etc. which helps when working with regulators, users, producers, etc.

TC 192 standards establish minimum requirements, allow innovation, and recognize different technical approaches to promote safe and operational excellence. This committee references internationally relevant standards where appropriate and where there is value.

Based on the market needs, this committee will assess technology and global trends (ex. disruptive technologies, cyber security, interoperability, environmental, etc) and initiate relevant activities in support of those needs.

4. REPRESENTATION AND PARTICIPATION IN THE ISO/TC/SC

4.1 Membership

Countries/ISO member bodies that are P and O members of the ISO committee – <https://www.iso.org/committee/54432.html>

4.2 Analysis of the participation

Today the ISO TC 192 membership is predominantly comprised of Gas Turbine manufacturer's, which has been reduced significantly due to the acquisitions and mergers in this industry over the past decade. There are a few testing/inspection organizations, users, and government membership participation. Country level participation is predominantly from North America and European countries which challenges the ability to create globally relevant standards. Attracting and maintaining diverse and balanced membership and expertise in this TC has historically been a challenge and continues to be concerning.

5. OBJECTIVES OF THE ISO/TC AND STRATEGIES FOR THEIR ACHIEVEMENT

5.1 Defined objectives of the ISO/TC

TC 192 is in place to prepare standards that will facilitate the application, testing, and servicing of gas turbine powered equipment. Creation of specific design standards is not an objective of the committee in this current business plan.

The committee will ensure that the international standards that it has developed remain applicable in the current market. In particular, the following aspects are to be kept as priority: - Safety, revision of relevant standards horizon 2019-2020 - Procurement, revision of standards horizon 2018-2019 - Power Generation, standards maintenance horizon 2020.

5.2 Identified strategies to achieve the ISO/TC's defined objectives

TC 192 reviews all proposals for new standards and if approved, a working group is established with a convener willing to coordinate the activity. These working groups will remain in place at least until the standard is published and most working groups will likely remain to work on revisions (reviewing), corrections, etc.

TC 192 has been effective in avoiding the duplication of standards. But some challenges remain, as close coordination with EU/CEN, which has resulted in the issuance of single standard on safety, has failed to achieve all the desired results of such coordination. Further

development and revision are intended to achieve global acceptability and recognition. Additionally, use of existing standards is being emphasized in TC 192.

TC 192 meets annually with intermediate action items handled electronically. WG meet as required during standards development or revision.

There are several liaisons in place with other TC's in place. The ones currently deemed essential in present standards development are found at the link:

<https://www.iso.org/committee/54432.html>

6. FACTORS AFFECTING COMPLETION AND IMPLEMENTATION OF THE ISO/TC WORK PROGRAMME

There are a variety of challenges that the ISO TC 192 committee faces. In the past several years, the gas turbine industry has consolidated to fewer manufacturers, which has resulted in a consolidation of experts and participants from predominately larger organizations. Additionally, with the down turn in the overall global economy over the past decade, it is more challenging to attract more variety of stakeholders to participate, which has resulted in a predominant 'manufacturer' participant membership. Also, standards development processes and timelines are being challenged due to lack of funding to support meetings both in person and on-line using web and teleconference tools. Lastly, expert attrition, continuity, and stakeholder diversity continues to be major concerns in development more relevant and balanced standards. ISO TC 192 relies on National bodies to help attract more diversity in stakeholder participation and to manage continuity of experts.

7. STRUCTURE, CURRENT PROJECTS AND PUBLICATIONS OF THE ISO/TC

This section gives an overview of ISO/TC 192 structure and scope. It also provides information on existing and planned standardization projects and publications.

7.1 Structure and scope of TC 192 can be found at this link.

<https://www.iso.org/committee/54432.html>

7.2 Current Projects of TC 192 can be found at this link.

<https://www.iso.org/committee/54432/x/catalogue/p/0/u/1/w/0/d/0>

7.3 Publications of TC 192 can be found at this link.

<https://www.iso.org/committee/54432/x/catalogue/p/1/u/0/w/0/d/0>

7.4 Reference information

Glossary of terms and abbreviations used in ISO/TC Business Plans

General information on the principles of ISO's technical work