BUSINESS PLAN
ISO/TC 60
Gears

EXECUTIVE SUMMARY

ISO/TC 60 serves the market for power transmission gears, rather than those used primarily for motion only, such as in toys and clocks. Power transmission gearing is characterized by its huge diversity and essential application into almost all industries, from transportation, industrial manufacturing, and power generation, through to such state of the art technological applications as windturbines and complex aerospace components. Gears must be capable of operating in extremes of environment. They must be available in every part of the world to support replacement demands. This requires gear products to be designed, manufactured, and measured using standardized methods. Power transmission gearing, in many forms, is a very mature product and standardization work has been taking place for almost 100 years. Nevertheless, design innovations, new materials, improved manufacturing technologies and an increasing demand for solutions by new and developing industries, require an active standardization agenda.

The world market for non-automotive industrial gear products for 2004 has been reported at approximately $12 Billion US dollars. The major producers are; Europe ~$ 6.4 Billion, USA ~$ 3.2 Billion, and Japan ~$ 2.3 Billion. The automotive (cars, trucks, off road, etc.) market has been estimated at 5 to 7 times higher per year than the non-automotive numbers.

It has been indicated that gears have been and will continue to be essential for many existing industries and in the development of new products and applications. As they are produced in extremely large numbers and with many thousands of variants, the work of ISO/TC 60 will be indispensable for the gear industry's manufacturers and users. Trade within the marketplace and end users need standardized methods when selecting and purchasing gears and when designing a product in order to obtain ease of use, good performance and replacement of components.

In addition, many of the major industries that use gear products are no longer producing for their own consumption. They are moving what has been historically captive production to an outside supplier. This outsourcing by major original equipment manufacturers (OEMs) will increase the demand on the traditional gearing industry. OEMs will continue to design their products, and then contract with suppliers to do the manufacturing. This practice increases the need for a set of coherent, universally accepted, world-class standards like those developed by TC60.

The primary goal of ISO/TC 60 is to ensure that gear standards are created, kept up to date with changing technologies, reflect the needs of the industries concerned, and give assurance to the end users that gear products are durable and safe.
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 programme 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 140 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 (ISO/TC), 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

The following political, economic, technical, regulatory, legal and social dynamics describe the business environment of the industry sector, products, materials, disciplines or practices related to the scope of this ISO/TC, and they may significantly influence how the relevant standards development processes are conducted and the content of the resulting standards:
ISO/TC 60 serves the market for power transmission gears, rather than those used primarily for motion only, such as in toys and clocks. Power transmission gearing is characterized by its huge diversity and essential application into almost all industries, from transportation, industrial manufacturing, and power generation, through to such state of the art technological applications as windturbines and complex aerospace components. Gears must be capable of operating in extremes of environment. They must be available in every part of the world to support replacement demands. This requires gear products to be designed, manufactured, and measured using standardized methods. Power transmission gearing, in many forms, is a very mature product and standardization work has been taking place for almost 100 years. Nevertheless, design innovations, new materials, improved manufacturing technologies and an increasing demand for solutions by new and developing industries, require an active standardization agenda. The primary goal of ISO/TC 60 is to ensure that gear standards are created, kept up to date with changing technologies, reflect the needs of the industries concerned, and give assurance to the end users that gear products are durable and safe.

2.1.1 Description of the industry: Suppliers/Manufacturers

Industry production can be segmented several ways. The most common is known as “open” or “loose” gears. These are gears, produced typically in pairs – the pinion and wheel – by small and medium suppliers. Open gears are produced to specifications and standards that are determined by the customer. Almost none of these manufacturers produce for their own use. The majority of these manufacturers produce smaller lots of gears for an OEM (original equipment manufacturer) or an intermediate supplier to the OEM. These manufacturers account for an estimated two-thirds of the number of manufacturers in the industry but only one-third of the value of production.

The second segment is known as “enclosed drive” manufacturers. These manufacturers supply complete assemblies, the transmission or enclosed drive, which an OEM will install in the final product. Typical applications (in addition to automotive transmissions) include drive systems for such industrial applications as material handling, high precision medical devices, lifting equipment, aerospace as well as mining and paper processing.

Many of the major industries that use gearing products are no longer producing for their own consumption. They are moving what has been historically captive production to an outside supplier. This outsourcing by major OEMs will increase the demand on the traditional gearing industry. OEMs will continue to design their products, and then contract with suppliers to do the manufacturing. This practice increases the need for a set of coherent, universally accepted, world-class standards like those developed by TC60.

Although Europe, Japan and the US all have several major manufacturers of products for this industry, the products are generally differentiated so that only a few actually compete for any specific application. The larger companies have international operations.

In this industry, the median company has about 100 employees. The largest have 500 to 1000 employees. Most manufacturers produce within a specific market. Thus, concentration tends to be less of a problem than in consumer-oriented industries.

With respect to new technologies, the gear industry is very much affected by innovations in metallurgy and surface finish technology, by new materials like powder metal and engineered plastics; and by new lubricants. The industry faces a threat from increasingly competitive motor and electronic control technology. Statically relying on yesterday’s designs will quickly prove to be a poor decision in today’s market for gearing.
2.1.2 **Description of the industry: Customers**

The market for the gearing industry is generally seen as having four major components – industrial; marine; aerospace; and automotive. Automotive is certainly the largest and is estimated to be at least three times the size of the other three sectors. (The data in clause 2 does not include the automotive industry.)

Industrial applications are the most common of the remaining uses for gearing. Applications such as equipment for material handling, for hydroelectric dams, for loading devices, for paper and pulp processing, for use in the production of other equipment like medical devices, sugar mills, food processing and the mining industry.

The aerospace and marine uses are relatively smaller than either the automotive or industrial sectors. Aerospace applications tend to be more demanding to produce, of more demanding quality, and of lower volume. Marine gearing tends to be more focused on power density and durability. Harsh operating environments in both of these sectors demand high quality gearing.

2.1.3 **Factors which may have an impact on future development**

Over the past years, the gear manufacturing industry has changed significantly. During the decade of the '90s, many of a generation of leaders who built the industry in the last half of the last century retired. Many companies have made the transition from being managed by members of the founding families to professional management. Presently, in general, highly qualified executives lead the industry.

The industry is increasingly global, as the cost of capital equipment with its high productivity has forced even small companies to look to the international market for customers. In many cases, capital costs are such that companies must increase volumes to simply cover higher costs. Moreover, new equipment is a necessity as customers demand increasingly high quality and faster delivery.

These factors led naturally to industry consolidation. Facing higher economic requirements and led by financially astute managers, the industry is consolidating in an effort to meet the demands of the market in a way that provides an adequate return to investors and stakeholders.

Other threats to the industry are largely technological and have been covered in this plan. Fortunately, the products of this industry are necessary for so much of the global productive economy that demands will remain adequate for the foreseeable future. New developments and technologies such as plastic and powder metal gears will grow in popularity; new motor and control technologies will displace some applications, but the bulk of gearing applications will continue to be healthy.

2.2 **Quantitative Indicators of the Business Environment**

The following list of quantitative indicators describes the business environment in order to provide adequate information to support actions of the ISO/TC:

The world gear market has three major sectors of production and consumption as well as several areas that are expected to be significant suppliers in the coming years. According to data developed by the trade associations in Europe, Japan and the United States, the world market for non-automotive gearing and related products was over 10 billion dollars in 1998 (the last year such comprehensive data was available). The comparable number in 1992 was $7.2 billion.
This table details production, trade and consumption by sector in 1992 and 1998, in US dollars.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total, $</th>
<th>Europe, $</th>
<th>Japan, $</th>
<th>United States, $</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td>10 032 000</td>
<td>5 410 000</td>
<td>1 910 000</td>
<td>2,711 000</td>
</tr>
<tr>
<td>Imports</td>
<td>3 009 000</td>
<td>1 707 000</td>
<td>133 000</td>
<td>1,168 000</td>
</tr>
<tr>
<td>Exports</td>
<td>4 343 000</td>
<td>2 914 000</td>
<td>858 000</td>
<td>570 000</td>
</tr>
<tr>
<td>Consumption</td>
<td>8 697 000</td>
<td>4 203 000</td>
<td>1 185 000</td>
<td>3,309 000</td>
</tr>
<tr>
<td>1992</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td>7,225 000</td>
<td>3,410 000</td>
<td>2,015 000</td>
<td>1,850 000</td>
</tr>
<tr>
<td>Imports</td>
<td>1,625 000</td>
<td>940 000</td>
<td>74 000</td>
<td>611 000</td>
</tr>
<tr>
<td>Exports</td>
<td>2,368 000</td>
<td>1,426 000</td>
<td>607 000</td>
<td>335 000</td>
</tr>
<tr>
<td>Consumption</td>
<td>6,482 000</td>
<td>2,924 000</td>
<td>1,482 000</td>
<td>2,126 000</td>
</tr>
</tbody>
</table>

[Note: Data based on statistics exchanged at the 1993 and 1999 World Gear Summit meetings. Japanese data come from official National statistics; European data is provided by the individual countries: Belgium, Germany, Finland, France, Italy, Spain, Sweden, Netherlands, and UK. The source for the US data is the US Department of Commerce, Census of Manufacturers. This data does not include automotive industry captive production.]

Other countries do make important contributions to both the manufacture and use of gearing products and to the work of developing ISO standards. Unfortunately, there are no readily available data for market activity in such countries as Australia, China, Czech Republic, India, Poland, etc. Each of these countries has a growing industry that is important to world production and consumption of gearing products.

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3 BENEFITS EXPECTED FROM THE WORK OF THE ISO/TC

It has been indicated that gears have been and will continue to be essential for many existing industries and in the development of new products. As they are produced in extremely large numbers and with many thousands of variants, the work of ISO/TC 60 will be indispensable for the gear industry's manufacturers and users. This is valid for products to be designed, manufactured, and measured using standardized methods. Trade within the marketplace and end users need standardized methods when selecting and purchasing gears and when designing a product in order to obtain ease of use, good performance and replacement of components.

4 REPRESENTATION AND PARTICIPATION IN THE ISO/TC

4.1 Countries/ISO members bodies that are P and O members of the ISO committee

4.2 Analysis of the participation

The ISO/TC 60 Committee membership varies between 35 and 40 national bodies (typically about half participating and the remaining observers) that include representatives from the major gear manufacturing countries in Asia, Europe and the USA. Together they cover the major portion of the world's manufacturing capacity and market.
Representatives from the major manufacturing and using countries of Belgium, France, Germany, Italy, Japan, Netherlands, Norway, Spain, Switzerland, UK, USA and others participate directly in standards development within the working groups of ISO/TC 60 and its subcommittees.

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

5.1 Defined objectives of the ISO/TC

The objectives of TC 60 include:

1. To elaborate a coherent library of standards that fulfill the needs of identified users covering specification, design, manufacturing, measurement and use of gears and drive components for power transmission applications in an efficient, timely and cost effective manner.

2. To ensure through a regular program of review that standards already published and available for use are up to date, reflecting the needs and technology at the time of review.

3. To review and adjust the work program as necessary in order to ensure that market needs are met.

4. To promote use of an internationally recognized standard vocabulary and system of product definitions for industry by the elaboration of nomenclature standards.

5. To provide calculation methods to determine capacities, test methods and selection methodology for gears used principally in power transmission applications.

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

In order to conduct its work effectively, ISO/TC 60 operates essentially as an administrative committee, appointing as many working groups as necessary for elaboration of the standards. A TC meeting is held jointly with its two subcommittees once every year to address administrative issues, conduct goal setting and priorities. This method has been chosen to enable work to continue between plenary meetings, with unhindered collaboration between those committee members who have a direct interest in the development of specific standards. The strategies to achieve the objectives of TC 60 include:

1. Establish working groups or ad hoc project teams for each work item with designated project leaders and operate with a project-based approach to standards development.

2. Establish priority of work items within subcommittees and working groups, giving priority to the timely circulation of documents and adherence to target dates.

3. Conduct meetings when necessary and use other means of communication to resolve issues and process documents (e.g., Internet, e-mail, Fax).

4. Coordinate concurrent meetings in the same location with multiple Working Groups.

5. Use a single language for meetings to obviate the problems of time and expense of organizing interpreters and translation.

Although, in certain circumstances, the TC or SC's will handle a particular task, the majority of the standards development work is carried out in the working groups, ad hoc project groups and editorial groups. The Convenor and the members of each group are selected for their expertise in the technology under consideration. In general, the working groups meet two times per year, with the work continuing by correspondence throughout the year.
6 FACTORS AFFECTING COMPLETION AND IMPLEMENTATION OF THE ISO/TC WORK PROGRAMME

The following factors have been identified which may affect, to a lesser or greater degree, the development of particular TC 60 standards:

a. The difficulty in finding project leaders who have the available resources to drive the work and a limited supply of new expert participants at the WG level to offset the withdrawal of, or reduction in commitment from key members.

b. The unavailability of responsive support at the WG level to assist the quick development of projects, due perhaps to a lack of individual resources or adequate technical resources to ensure the preparation of relevant standards.

c. The difficulty in creating the mandated CS document formats without a much-increased workload for the TC and respective SC Secretariats.

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

This section gives an overview of the ISO/TC’s structure, scopes of the ISO/TCs and any existing subcommittees and information on existing and planned standardization projects, publication of the ISO/TC and its subcommittees.

7.1 Structure of the ISO committee

7.2 Current projects of the ISO technical committee and its subcommittees

7.3 Publications of the ISO technical committee and its subcommittees

Reference information

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

General information on the principles of ISO’s technical work