BUSINESS PLAN
ISO/TC 45
RUBBER AND RUBBER PRODUCTS

EXECUTIVE SUMMARY

ISO/TC45’s business is the development of rubber and rubber product standards. The wide variety of rubber and rubber products makes the job of standards development a very challenging one, and one in which careful planning and prioritization of projects is vital.

The world’s rubber (both raw rubber and rubber products) industry is continuously expanding. The growth in recent years averages some two percent. Current world consumption of rubber stands 21.5 million tonnes. The value of world trade in rubber products is in excess of US$50 billion. Thus, there is a compelling need for International Standards on rubber, rubber products and rubber compounding ingredients, which encompass their specifications and testing.

ISO/TC45 has published some 400 International Standards. It would be difficult to imagine what the world trade in rubber, rubber products and rubber compounding ingredients would be like without the existence of ISO/TC45 standards. The ready global acceptance of ISO/TC45 standards reflects the international nature of its P-membership, which is split almost 50:50 between the developed and developing countries. In many countries, standards developed by ISO/TC45 have been adopted as national standards. This is a manifestation of their relevance. To facilitate in finding a solution to the latex allergy problem, ISO/TC45 has developed a standard for the determination of water-extractable proteins in medical gloves. In response to the earthquake in Turkey of 1999 which left 17,000 people dead, ISO/TC45 embarked on a project to develop an International Standard for elastomeric earthquake bearings, which will facilitate their use to protect buildings and their occupants from the devastating effects of earthquakes.

ISO/TC45 is a mature technical committee of ISO with a large number of standards within its remit. The relevance of these standards has to be maintained, taking into account the rapid development in science and technology. Increasingly, there is a need for standards on rubber and rubber products to take into account factors related to safety and the environment. Issues of recycling will feature prominently in the work of ISO/TC45 in the next few years. So will issues related to the health hazards of chemicals used in rubber product manufacture. Indeed, ISO/TC45 has made a start in this direction by setting up a Working Group on Environmental Aspects to review issues of safety and the environment, relevant to rubber and rubber products, with the objective of establishing standards development programs to address them.
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:
SUPPLY AND DEMAND

World rubber consumption and production

In 2006, elastomer consumption was estimated to have grown by around 2.1% to 21.5 million tonnes. For 2007, the IRSG Secretariat anticipates world elastomer usage to grow by about 4.0% to 22.3 million tonnes. Demands for elastomers, both synthetic rubber (SR) as well as natural rubber (NR), is well secured, in line with improvements in living standards around the world. Synthetic rubber is purely an industrial raw material. The producing and consuming industries are in general closely related and dominated by large and global enterprises. Being a petroleum derived product and manufactured by polymerisation process in chemical plants, the management of supply against demand is relatively straightforward. To a certain extent, the prices of its basic ingredients namely the monomers are more or less influenced by the price of petroleum. Growth in the SR sector was higher at 2.5%, with consumption increasing to 12.2 million tonnes.

Natural rubber, on the other hand, is also consumed as an industrial raw material. Consumption of NR grew by an estimated 1.5% to 9.2 million tonnes while growth in the SR sector was higher at 2.5%, with consumption increasing to 12.2 million tonnes. In rubber articles, the two kinds of elastomers are never distinguished by users. It could be natural, synthetic or blends of various rubbers in different proportions. The choice on the kinds of rubbers to be used is on the grounds of technological merit and economic availability. For example, 70% of NR and 60% of SR have been manufactured into automotive tyres.

Trend in NR and SR production

Virtually all NR producing countries saw an increase with the Asian region accounting over 90% of natural rubber output. The major exporters of NR today are Thailand, Indonesia, and Malaysia, which accounted for approximately 84.10 percent of the total world exports in 2005. Rubber planting projects are on the rise as the cost of NR has drastically increased in recent years, driven by growing demands from tyre manufacturer's which consume over 75% of the world's NR. As area and yield have continued to increase in Thailand and India, the gap between the leading producer and the rest has widened. Growth in other countries is relatively low, especially in Africa.

SR output has similarly increased in all producing regions. There is a continued rise in the growth of output in North America, Latin America, Other Europe, Asia/Oceania and the European Union.

World rubber consumption

World total rubber consumption rose to 21.5 million tonnes in 2006. Generally, the largest consumers of rubber are the Asia/Oceanic region with the increase in usage in China raising the nation's position as the world’s leading rubber consuming country.

Natural rubber accounts for 43.1% consumption while synthetic rubber accounts for 56.9% consumption. Synthetic rubber consumption has been rising in major rubber producing countries whose economies are being increasingly industrialised.

NR latex sector consumption

The world NR latex consumption has reached just over 7 million tonnes. In 2003, Asia consumed about three quarter of the global NR latex, with North America a distant second consuming followed by EU. Natural rubber latex is widely used in medical gloves, thread and
condom applications. Gloves are by far the largest market sector, consuming around 60% by weight.

The main reason for the increase consumption arises from the increased use of disposable gloves in the medical industry and the search for elastomers which do not promote allergic reactions. Natural rubber latex gloves have been shown to provide the best barrier protection against the transmission of viruses and other bloodbourn pathogens. However, because of the latex protein sensitisation to certain individuals, other non-natural rubber latex gloves are being steadily used in the market. These synthetic alternatives must have adequate barrier protection, which is the most important reason for wearing protective gloves. This is turn has led to new and improved International Standards being developed for these new materials.

Although attempts are being made to replace natural rubber with synthetics, but currently this is not generally cost effective. The NR latex sector is a very competitive market and much of the production industry has been moved to Asia to reduce costs.

**Major factors which may have an impact on the development of the markets**

Natural rubber as an agricultural product is stable in its supply in a short term. There is, however, concerned that the balance of demand and supply in a long term is subject to the expansion of tyre demand and rubber consumption in China.

Although the demand is steadily increasing, the concerns on the supply persist due to the limited source of the production (Thailand, Indonesia, and other Southeast Asian countries) and the price hike caused by that of crude oil.

Synthetic rubber accompanies the concerns on the stable supply of the raw materials used since the oil price is rising. Volatile situation in Middle East and the consumption increase of oil especially in China and India might lead to the shortage of raw materials in the future.

With the rise of environmental awareness, regulations on chemicals mainly in Europe (ROHS, REACH, etc) are prominent recently, and their influence on rubber products is unavoidable. There are cases where chemicals labelled as hazardous are forced out of the production line of rubber products. In addition, labour and cost for the verifications of the chemicals used and their quantity in the products and safety of the chemicals should be taken into account.

**GENERAL DESCRIPTION OF THE MARKET**

Natural rubber, as the name implies, is obtained from naturally occurring species, in this case, from latex of rubber trees. Natural rubber is obtained from the milky secretion (latex) of certain plants. The only important source of natural rubber, however, is the tree Hevea Brasiliensis. Synthetic rubber is made from raw materials derived from petroleum, coal and natural gas. Many of the synthetic rubbers are copolymers, i.e. polymers consisting of more than one monomer.

The bulk of natural rubber is produced mainly in Thailand, Indonesia, Malaysia, India, some African countries, Sri Lanka and Vietnam. Natural rubber can be produced as a liquid product in the form of latex concentrate or as a solid product in the form of sheet and block rubber. Synthetic rubber is available in the solid form as well as liquid form. The main producers of synthetic rubber are Europe, North America and Japan. The synthetic rubber industry may form part of the tyre industry, the petrochemical industry or be independent.
DIVERSITY OF END USES

Industrial Rubber Goods (IRG)

Besides tyres, other rubber products made from bale synthetic and natural rubbers include industrial rubber products of various belts, hoses, tyres, tubes and other rubber products. While IRG are used by virtually all industries, the dominant market is automotive eg hoses, air-conditioner hoses, transmission belts, oil seals and gaskets, weather-strips, glass encapsulation, air dams, CV boots, engine-mounts for use in sound and vibration control in structures, aircraft, rocket motors, locomotives, ships, docks, flood control barriers, bridge bearings, bearings to protect structures from external and internal noise and vibration, bearings to protect structures from earthquakes, engine mounts (for automobiles, locomotives, ships, rocket motors, etc), dock fenders, rail pads, flood prevention barriers, etc.

Under the ISO/TC 45 structure, TC45/SC 1 covers rubber and thermoplastic tubes and hoses for a wide range of applications from aerospace and automotive to industry and agriculture. Over the years, new polymeric materials have been developed and there has been a growing trend in the use of thermoplastics as they continually improve their performance. This has given rise to work to develop new standards or extend rubber only standards to encompass these innovations in materials and hose technologies.

The car manufacturers have drawn up their own specific automotive standards in the past, but now the trend is to use ISO standards wherever possible. It is anticipated that the demand for belts and hoses would be dramatically affected by technological developments in cars. One such example would be the fuel cell powered car, which would drastically reduce the need for hoses and belts. Other important markets include conveyor belts for mining and forestry operations, roll flooring and consumer products. Key factors influencing competitiveness in the IRG are scale of production, relative level of technology, service to customers and approximation to market.

In the wire and cable production, the recent trend is to use thermoplastic materials instead of vulcanised rubber, although the latter is still required for heat and chemical resistance. For household cables, non halogen materials are increasingly sought after because of environmental concerns. Nevertheless, rubber cables are still required for high voltage power transmission in areas such as rail transport

World carbon black

Driven mainly by the steady expansion of the world rubber market, global demand for carbon black indicates a positive and steady growth. While roughly 95% of demand will remain linked to its use as a reinforced material in rubber tires, belts and hoses; the strongest gains are for higher value special blacks in plastics, inks and coatings.

Tyre industry

The tyre industry, which includes truck, aircraft, earthmover, passenger car and cycle tyres, tubes and curing bladders consumes two-thirds of the solid forms of natural and synthetic rubber produced and is characterised by the dominance of a few large global companies. Natural rubber is largely consumed by the tyre industry because of its excellent properties both during manufacture and in the end product.

Heavy duty truck tyres form the largest single market segment for NR. This is followed by tyres for aircraft and earthmoving equipment, which are highly demanding applications and reflects
NR excellent properties. Lesser quantities are used in passenger car tyres, but overall uptake in this sector remains highly significant.

Outside of the tyre and engineering sectors, demand for thermoplastic elastomers (TPEs) has become a significant force outstripping those of conventional elastomers. The rapid increase in consumption is driven by low production costs, including zero waste, perceived recyclability and new uses such as overmoulded soft touch application. TPEs are perceived as being 'clean' in terms of food contact and low emission during manufacture of products adds to the environmental credentials of TPEs. The continued growth at the expense of conventional elastomers presents challenges as well as opportunities to the rubber industry.

The automotive market will remain the largest consumer of TPEs at the global level. New products replacing EPDM and polyvinyl chloride parts are driving the increasing automotive demand. But consumer and sporting goods sector will be the fast growing markets for TPEs.

Global TPE sales will remain concentrated in the US, Japan and Western Europe, but many developing countries, particularly in Asia are rapidly increasing demand for the material. China is the leader in this area with most of its use directed to its footwear industry.

The remainder of the solid rubber is used in the general rubber goods sectors.

Products include conveyor belting, hose, extruded profiles, golf balls, flooring, footwear, electrical insulation, medical goods, coated fabrics, cellular material, non-automobile engineering components for use in sound and vibration control in structures, aircraft, rocket motors, locomotives, ships, docks, flood control barriers, bridge bearings, bearings to protect structures from external and internal noise and vibration, bearings to protect structures from earthquakes, engine mounts (for automobiles, locomotives, ships, rocket motors, etc), dock fenders, rail pads, flood prevention barriers, sports goods (tennis, golf and squash balls, football bladders) etc.

**General Rubber Goods (GRG)**

In the general rubber goods sector, there is a strong increase in Asia; outside Japan and all other regions are steady. The dipped good sector especially for NR is a major contributor in the GRG. While synthetic rubber was used in a large number of end-users, it lost quite a number of end-uses to other synthetic materials for example thermoplastic elastomers in automotive components.

The statistics for the general rubber goods sector in the USA, France, UK and Taiwan indicate this sector has recovered slightly with improvement in economy, tightened capacity and cost cutting measures. Over capacity, rising cost of materials and increasing competition have been important factors influencing the weakness in the markets.

**Social, safety, health, environmental, cultural issues related to the rubber sector**

The rubber industry has long appreciated the need for safety both in the workplace and in the service environment. The industry also recognizes that rubber products need to be made of materials that do not impose a health hazard. In recent years, the industry has been equally aware of environmental needs including recycling and safe disposal of rubber and rubber product wastes.

In this context, contributions from ISO/TC 45 are needed in developing new test methods and specifications for rubber and rubber products, including recycled rubber materials, to meet
existing legislations and impending legislative developments related to safety, health and the environment. In particular, ISO/TC 45 has to do the following:

- Develop more stringent specifications for materials and products, to exclude the use of compounding ingredients which are known to be hazardous to health, including those used in food and portable water contact applications;
- Generate more testing -- both physical and chemical -- requirements to enhance the safety of rubber and rubber products;
- Identify and develop test methods for the evaluation of the safety of rubber compounding ingredients, including rubber process oils;
- Review continually the latex protein allergy problem;
- Consider ways for the recovery, treatment and disposal of toxic and hazardous waste materials from the rubber processing and rubber product manufacturing sectors waste disposal of rubber products.

**REAL OR POTENTIAL TBT**

Technical barriers to trade often occur in international trade when countries have their own unique national standards and technical regulations. Several rubber/latex products are widely regulated within ISO member countries. In the area of medical devices such as medical gloves, the requirements set by non harmonised national and regional standards pose a barrier to trade.

Close liaison with regulatory and health authorities is necessary, given their influence on standards and technical resolutions in respect of medical gloves and other rubber based products. In addition, the added cost of production in order to satisfy these non harmonised requirements adversely affect the glove manufacturers and increase costs for consumers.

The fulfillment of requirements set by the purchasers is another concerned. Trade and business practices dictate regional standards or national standards to be preferred in cases where international standards are not widely adopted. For EC countries, adoption of ISO standards as the Europeans standards under the European Committee for Standardization (CEN) will automatically make them the national standards of the CEN member countries. ISO/TC 45 thus has an on-going cooperation with CEN under the Vienna Agreement framework to facilitate harmonisation.

In order to make international standards more relevant, ISO should continue to promote the adoption of its standards by all its members as an indirect means of promulgating the use of international standards.

**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:

World consumption of elastomers is more than 21.5 million tonnes of which natural rubber accounts for 43.1% while synthetic rubber accounts for 56.9%. Generally, the largest consumers of rubber are the developed countries which are also the principal producers of synthetic rubber. The Asian region accounts for over 90% of natural rubber output with about 80% from the South East-Asian countries, Bangladesh, Cambodia, Indonesia, Malaysia, Myanmar, Philippines, Thailand and Vietnam. Africa and Latin America accounts for the
remaining production. The major producers of synthetic rubber are North America, European Union, other Europe (includes Commonwealth of Independent States), and Asia/Oceania.

The major consumer for natural rubber is Asia/Oceania accounting for about 60% of the global consumption, followed by North America and European Union. The Americas and Western Europe together continue to account for about 1/3 of global consumption of natural rubber.

Synthetic rubber now accounts for 3/5 of the world elastomer consumption. Its share of global consumption has been declining since reaching its peak in 1979, but the decline now appears to be slowing down because of increased elastomer demand from central and eastern Europe. In addition, synthetic rubber consumption has been rising in major natural rubber producing countries whose economies are becoming increasingly industrialised.

The consumption of natural rubber and the consumption of synthetic rubber by regions in 2006 are as given in Table 1 and Table 2 respectively.

The top ten producing countries of natural rubber and the top ten producing countries of synthetic rubber for 2006 are as given in Table 3 and Table 4 respectively. The top ten consuming countries of synthetic rubber and the top ten consuming countries of natural rubber are as given in Table 5 and Table 6 respectively. The production of natural rubber latex in selected countries is given in Table 7 and the world rubber consumption is given in Table 8.

**Table 1: Consumption of natural rubber by regions for 2006**

<table>
<thead>
<tr>
<th>Year</th>
<th>North America</th>
<th>South America</th>
<th>EU</th>
<th>Other EU</th>
<th>Other Europe</th>
<th>Africa</th>
<th>Asia</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>1148.2</td>
<td>367.3</td>
<td>1194.6</td>
<td>85.2</td>
<td>177.0</td>
<td>117.8</td>
<td>5937.8</td>
</tr>
</tbody>
</table>

Source: International Rubber Study Group

Note: The EU covers 25 member countries excluding Romania and Bulgaria

**Table 2: Consumption of synthetic rubber by regions for 2006**

<table>
<thead>
<tr>
<th>Year</th>
<th>North America</th>
<th>South America</th>
<th>E.U.</th>
<th>Other E.U.</th>
<th>Other Europe</th>
<th>Africa</th>
<th>Asia</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>2031.8</td>
<td>583.6</td>
<td>2233.2</td>
<td>274.4</td>
<td>912.5</td>
<td>101.0</td>
<td>5646.3</td>
</tr>
</tbody>
</table>

Source: International Rubber Study Group

Note: The EU covers 25 member countries excluding Romania and Bulgaria
### Table 3: Top ten producing countries of natural rubber for 2006

1000 tonnes

<table>
<thead>
<tr>
<th>Year</th>
<th>Thailand</th>
<th>Indonesia</th>
<th>Malaysia</th>
<th>India</th>
<th>Vietnam</th>
<th>China</th>
<th>Ivoire</th>
<th>Lanka</th>
<th>Brazil</th>
<th>Liberia</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>2346.4</td>
<td>1501.1</td>
<td>927.6</td>
<td>629.0</td>
<td>290.8</td>
<td>445.0</td>
<td>122.8</td>
<td>87.6</td>
<td>87.8</td>
<td>105.0</td>
</tr>
<tr>
<td>2001</td>
<td>2319.6</td>
<td>1607.3</td>
<td>882.1</td>
<td>631.5</td>
<td>312.6</td>
<td>464.0</td>
<td>127.9</td>
<td>86.2</td>
<td>88.1</td>
<td>107.0</td>
</tr>
<tr>
<td>2002</td>
<td>2615.1</td>
<td>1630.0</td>
<td>889.8</td>
<td>640.8</td>
<td>331.4</td>
<td>468.0</td>
<td>120.0</td>
<td>90.5</td>
<td>89.0</td>
<td>109.0</td>
</tr>
<tr>
<td>2003</td>
<td>2876.0</td>
<td>1792.2</td>
<td>985.6</td>
<td>707.1</td>
<td>363.5</td>
<td>480.0</td>
<td>127.0</td>
<td>92.0</td>
<td>94.0</td>
<td>108.0</td>
</tr>
<tr>
<td>2004</td>
<td>2984.3</td>
<td>2066.2</td>
<td>1168.7</td>
<td>742.6</td>
<td>419.0</td>
<td>486.0</td>
<td>143.0</td>
<td>94.7</td>
<td>101.4</td>
<td>115.0</td>
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<tr>
<td>2005</td>
<td>2937.2</td>
<td>2271.0</td>
<td>1126.0</td>
<td>771.5</td>
<td>468.6</td>
<td>428.0</td>
<td>157.0</td>
<td>104.4</td>
<td>106.5</td>
<td>111.0</td>
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<tr>
<td>2006</td>
<td>2967.5</td>
<td>2515.1</td>
<td>1268.4</td>
<td>853.1</td>
<td>560.0</td>
<td>483.0</td>
<td>156.0</td>
<td>114.7</td>
<td>108.3</td>
<td>100.5</td>
</tr>
</tbody>
</table>

Source: International Rubber Study Group

### Table 4: Top ten producing countries of synthetic rubber for 2006

1000 tonnes

<table>
<thead>
<tr>
<th>Year</th>
<th>USA</th>
<th>China</th>
<th>Japan</th>
<th>Russian Fed</th>
<th>Germany</th>
<th>Rep of Korea</th>
<th>France</th>
<th>Taiwan</th>
<th>Brazil</th>
<th>UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>2062.1</td>
<td>1052.4</td>
<td>1465.5</td>
<td>919.2</td>
<td>828.4</td>
<td>662.5</td>
<td>671.7</td>
<td>479.7</td>
<td>341.9</td>
<td>332.8</td>
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<tr>
<td>2002</td>
<td>2164.4</td>
<td>1132.9</td>
<td>1522.0</td>
<td>919.0</td>
<td>869.2</td>
<td>685.0</td>
<td>681.1</td>
<td>523.1</td>
<td>383.7</td>
<td>336.9</td>
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<tr>
<td>2003</td>
<td>2270.1</td>
<td>1272.2</td>
<td>1577.4</td>
<td>1070.0</td>
<td>888.0</td>
<td>710.0</td>
<td>717.7</td>
<td>528.8</td>
<td>406.5</td>
<td>327.0</td>
</tr>
<tr>
<td>2004</td>
<td>2325.1</td>
<td>1477.6</td>
<td>1616.1</td>
<td>1116.1</td>
<td>905.0</td>
<td>720.0</td>
<td>776.0</td>
<td>545.0</td>
<td>429.1</td>
<td>351.1</td>
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<tr>
<td>2005</td>
<td>2365.8</td>
<td>1632.1</td>
<td>1626.9</td>
<td>1146.0</td>
<td>855.0</td>
<td>770.0</td>
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<td>575.0</td>
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<td>2006</td>
<td>2413.3</td>
<td>1812.6</td>
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<td>1219.0</td>
<td>865.0</td>
<td>820.0</td>
<td>663.9</td>
<td>600.0</td>
<td>417.5</td>
<td>305.0</td>
</tr>
</tbody>
</table>

Source: International Rubber Study Group
### Table 5: Top ten consuming countries of synthetic rubber
1000 tonnes

<table>
<thead>
<tr>
<th>Year</th>
<th>China</th>
<th>USA</th>
<th>Japan</th>
<th>Germany</th>
<th>Russian Fed</th>
<th>Brazil</th>
<th>Rep of Korea</th>
<th>France</th>
<th>Taiwan</th>
<th>India</th>
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</thead>
<tbody>
<tr>
<td>2001</td>
<td>1575.0</td>
<td>1839.5</td>
<td>1085.1</td>
<td>613.0</td>
<td>575.0</td>
<td>333.8</td>
<td>373.0</td>
<td>464.5</td>
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<tr>
<td>2002</td>
<td>1575.0</td>
<td>1895.0</td>
<td>1096.0</td>
<td>612.0</td>
<td>551.0</td>
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<td>365.0</td>
<td>469.3</td>
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<td>1926.4</td>
<td>1110.7</td>
<td>615.0</td>
<td>619.0</td>
<td>352.4</td>
<td>352.2</td>
<td>493.2</td>
<td>290.0</td>
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<tr>
<td>2004</td>
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<td>1906.8</td>
<td>1146.3</td>
<td>624.5</td>
<td>597.0</td>
<td>430.7</td>
<td>349.1</td>
<td>420.1</td>
<td>294.0</td>
<td>222.7</td>
</tr>
<tr>
<td>2005</td>
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<td>2002.1</td>
<td>1156.0</td>
<td>635.0</td>
<td>568.0</td>
<td>404.8</td>
<td>343.7</td>
<td>354.9</td>
<td>280.0</td>
<td>233.4</td>
</tr>
<tr>
<td>2006</td>
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<td>1170.8</td>
<td>635.0</td>
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<td>425.1</td>
<td>335.8</td>
<td>310.8</td>
<td>303.0</td>
<td>264.3</td>
</tr>
</tbody>
</table>

Source: International Rubber Study Group

### Table 6: Top ten consuming countries of natural rubber
1000 tonnes

<table>
<thead>
<tr>
<th>Year</th>
<th>China</th>
<th>U.S.A.</th>
<th>Japan</th>
<th>India</th>
<th>Malaysia</th>
<th>Rep of Korea</th>
<th>Indonesia</th>
<th>Thailand</th>
<th>Brazil</th>
<th>Germany</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>1330.0</td>
<td>974.1</td>
<td>729.2</td>
<td>630.6</td>
<td>400.9</td>
<td>331.8</td>
<td>142.0</td>
<td>253.1</td>
<td>215.9</td>
<td>246.0</td>
</tr>
<tr>
<td>2002</td>
<td>1395.0</td>
<td>1110.8</td>
<td>749.0</td>
<td>680.0</td>
<td>407.9</td>
<td>325.6</td>
<td>145.0</td>
<td>278.4</td>
<td>233.4</td>
<td>247.0</td>
</tr>
<tr>
<td>2003</td>
<td>1525.0</td>
<td>1078.5</td>
<td>784.2</td>
<td>717.1</td>
<td>420.8</td>
<td>332.6</td>
<td>156.0</td>
<td>298.7</td>
<td>255.5</td>
<td>260.3</td>
</tr>
<tr>
<td>2004</td>
<td>2000.0</td>
<td>1143.6</td>
<td>814.8</td>
<td>745.3</td>
<td>402.8</td>
<td>351.7</td>
<td>196.0</td>
<td>318.6</td>
<td>284.9</td>
<td>242.3</td>
</tr>
<tr>
<td>2005</td>
<td>2150.0</td>
<td>1159.2</td>
<td>857.4</td>
<td>789.2</td>
<td>386.5</td>
<td>369.8</td>
<td>221.0</td>
<td>334.6</td>
<td>301.8</td>
<td>263.0</td>
</tr>
<tr>
<td>2006</td>
<td>2400.0</td>
<td>1003.1</td>
<td>873.7</td>
<td>815.1</td>
<td>383.3</td>
<td>363.6</td>
<td>355.0</td>
<td>320.9</td>
<td>286.8</td>
<td>269.2</td>
</tr>
</tbody>
</table>

Source: International Rubber Study Group
Table 7: Production of Natural Rubber Latex in Selected Countries
1000 tonnes

<table>
<thead>
<tr>
<th>Brazil</th>
<th>Guatemala</th>
<th>China</th>
<th>India</th>
<th>Malaysia</th>
<th>Sri Lanka</th>
<th>Thailand</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.8</td>
<td>17.7</td>
<td>44.5</td>
<td>65.7</td>
<td>153.4</td>
<td>15.3</td>
<td>292.2</td>
</tr>
<tr>
<td>8.8</td>
<td>19.5</td>
<td>46.4</td>
<td>63.5</td>
<td>120.5</td>
<td>19.5</td>
<td>463.9</td>
</tr>
<tr>
<td>8.0</td>
<td>21.1</td>
<td>46.8</td>
<td>74.3</td>
<td>109.5</td>
<td>20.5</td>
<td>470.8</td>
</tr>
<tr>
<td>8.5</td>
<td>19.3</td>
<td>48.0</td>
<td>76.1</td>
<td>131.0</td>
<td>17.8</td>
<td>488.9</td>
</tr>
<tr>
<td>10.1</td>
<td>21.1</td>
<td>48.6</td>
<td>74.0</td>
<td>207.9</td>
<td>17.8</td>
<td>507.3</td>
</tr>
<tr>
<td>10.7</td>
<td>22.9</td>
<td>42.8</td>
<td>78.3</td>
<td>190.4</td>
<td>18.2</td>
<td>602.1</td>
</tr>
<tr>
<td>10.8</td>
<td>21.6</td>
<td>48.3</td>
<td>85.9</td>
<td>196.3</td>
<td>20.9</td>
<td>608.4</td>
</tr>
</tbody>
</table>

Source: International Rubber Study Group

Table 8: World rubber consumption

<table>
<thead>
<tr>
<th>Region</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Asia and India</td>
<td>48%</td>
</tr>
<tr>
<td>North America</td>
<td>16%</td>
</tr>
<tr>
<td>European Union</td>
<td>17%</td>
</tr>
<tr>
<td>Other Europe</td>
<td>9%</td>
</tr>
<tr>
<td>Latin America</td>
<td>6%</td>
</tr>
<tr>
<td>Rest of the world</td>
<td>4%</td>
</tr>
</tbody>
</table>


3 BENEFITS EXPECTED FROM THE WORK OF THE ISO/TC

3.1 The main benefit expected from work in this committee would be reaching a global market for rubber and its products with the elimination of technical barriers to trade.

3.2 The harmonization of different approaches of standardization of rubber and rubber products for a global approach is also carried out. An example is the determination of the extractable protein level in latex of which the ASTM, CEN and ISO methods are currently being harmonized.

3.3 Preparation of original international standards for developing and emerging technologies for which national standards do not exist can result in benefits for the rubber industry. With the adoption of these international standards as national standards, member bodies can then gain in resources by not duplicating work.

3.4 An international accepted test procedures developed by ISO/TC 45 will help to gain mutual recognition amongst the industry fraternity, hence avoiding repeatability in testing. In addition to the cost reduction, the standardised test procedures serve as tools to increase market access and development of trade.
3.5 ISO/TC 45 test methods provide the means to enable objective assessment of process, raw materials, semi-finished products and products on their suitability for use. The test methods also evaluate raw materials used in the manufacture of finished products for important aspects like tensile properties, determination of total solid content, etc.

3.6 Countries such as Japan, China, Thailand and Malaysia have aligned their national standards for rubber and rubber products with the international standards. Regional fora such as ASEAN Consultative Committee for Standards and Quality (ACCSQ) have identified 20 priority products for harmonizing of corresponding national standards to the ISO standards. Standards on medical gloves, ISO 11193-1: 2003 and ISO 10282: 2002 were identified as the referenced international standards for the purposes of alignment. The harmonising process will help to remove barriers to trade brought about by differing Technical Regulations in member countries.

3.7 Several standards developed by ISO/TC 45 have been quoted as normative references in other international standards such as ISO/TC 61 and ISO/TC 157.

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

ISO/TC 45 is represented by the principal players of this field, that is by the western countries. The most important and active groups represented are the main producers and consumers of rubber and rubber products notably, North America, Europe and Japan. Small but growing downstream rubber industries such as those of Thailand, Malaysia and Indonesia which are also the major producers of natural rubber are also represented.

Presently ISO/TC 45 has 28 active participating ‘P’ members and 28 observing ‘O’ members. The following member countries are represented in the committee.

P-members:

Belgium, Brazil, Canada, China, Czech Republic, Egypt, France, Germany, Hungary, India, Iran, Italy, Japan, Kenya, Korea, Republic of, Malaysia, Netherlands, Nigeria, Philippines, Russian Federation, South Africa, Spain, Sri Lanka, Sweden, Thailand, Turkey, USA, United Kingdom.

O-members:

Australia, Austria, Bulgaria, Croatia, Cuba, Ecuador, Finland, Greece, Hong Kong, China, Indonesia, Ireland, Korea, Democratic People’s Republic, Mauritius, Mexico, Pakistan, Poland, Portugal, Romania, Saudi Arabia, Serbia, Singapore, Slovakia, Tanzania, Trinidad and Tobago, Tunisia, Ukraine, Venezuela, Vietnam.

Japan has shown strong growing interest in rubber by sending the largest number of delegates to the annual ISO/TC 45 meetings for the past few years.
The international organisations in liaison with ISO/TC 45 include ASD-STAN, EC, IISRP, IRRDB, WCO. Internal ISO committees in liaison with the ISO/TC 45 include ISO/TC 31 and ISO/TC 61.

Malaysia, as one of the major natural rubber producing country, and the world largest producer of latex medical gloves, latex thread and major producer of a host of other latex rubber products, holds the secretariat of ISO/TC 45, SC1 and SC 4. Two other developed countries, Sweden holds the secretariat of SC 2 and the secretariat of SC 3 is held by France and Brazil under the twinning programme concept.

The breakdown in the number of countries holding Convenorships of Working Groups is as follows:

USA (3), UK (8), Sweden (3), Thailand (1), France (1), Japan (2), Germany (3), the Netherlands (1), and Malaysia (2). Based on these figures, nearly 90% of the Convenorships of Working Groups are held by developed countries.

The low participation amongst developing countries and countries with economies in transition in the depth of participation is a result of several factors including availability of technical resources, level of awareness, and lack of financial support for experts to attend meetings.

The TC leadership recognises the importance of the involvement of developing countries in standards making and will continue to address and encourage developing countries to participate actively in areas of responsibility within TC and SC.

It is interesting to observe that larger delegates from developed countries tend to be a mix of industrialist, consultants, government and NSB representatives. The smaller delegations from developing countries tend to be governmental and NSB representatives.

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

5.1 Defined objectives of the ISO/TC

1. To develop a package of international standards for rubber and rubber products covering the following aspects:

i. Terminology, nomenclature and glossary.
ii. Physical and chemical test methods utilised.
iii. Raw material (natural and synthetic rubbers including latex) and rubber compounding ingredients (black and non black, reinforcing and non reinforcing fillers, sulphur and non sulphur vulcanizing agents, anti-oxidants, anti-degradants and anti-ozonants, processing aids accelerators, and additives such as plasticizers, resins, tackifiers and reinforcing agents.
iv. Grading systems for physical and chemical properties; technical classification of standards based on physical and chemical properties.
v. Methods of sampling.
vi. Finished and semi-finished rubber products:
   - all types of general industrial, chemical and petrochemical hoses, hose assemblies and tubing, automotive hoses and hydraulic hoses, hoses and hose assemblies for compressed natural gas (CNG) pipeline supply (rubber and thermoplastics, reinforced and non reinforced);
   - cellular material (flexible and semi-rigid cellular material made from natural and synthetic rubber materials);
   - coated fabrics (rubber and thermoplastics coated);
- other miscellaneous products such as rubber threads, sealing rings for pipes, rubber roof covering, rubber-covered rollers, elastomeric isolators for seismic protection, vibration mounts, rubber teats for feeding bottles (natural and synthetic), gloves for general and medical applications (rubber and thermoplastics) and rubber products for specific applications.

2. The work programme of the committee is directed towards serving the global market and eliminating trade barriers whilst keeping close contact with the continuing changes in the industry and their user requirements.

3. Participation

To widen the active participation of the membership in the development of new standards, each member country should be active on at least one WG.

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

1. General approaches

a) ISO/TC 45 will produce terminology and classification standards for a more consistent and uniform use of definitions and to ease the development of the test method and product standards and interchangeability of products manufactured throughout the world.

b) ISO/TC 45 will develop test method standards including precision data obtained from round-robin tests for reference in the product standards.

c) When and where possible, ISO/TC 45 will implement the Vienna Agreement parallel procedure and keep close contact with other standards organization in order to avoid duplication of standardization work in this area.

d) To increase the efficiency of work, ISO/TC 45 will work by correspondence whenever possible and organize meetings only to discuss draft documents when active feedback and dialogue is needed for progression of the draft to the next stage.

e) ISO/TC 45 and its sub-committees will continue reviewing its working procedures and internal structure with the aim of improving efficiency and the timely delivery of documents and adherence to target dates.

f) ISO/TC 45 will proceed with the preparation of new International Standards by using regional or national standards or company standards, in which copyright permission has been obtained, as starting documents where no appropriate ISO standards exists for use as a reference standard.

g) ISO/TC 45 will use the five year systematic review more effectively and will identify opportunities for quality improvements.

h) ISO/TC 45 recommends that new work item proposal (NP) will only be balloted and/or registered when they are ready to start working hard to develop the standard in accordance with the time frame given by the ISO schedule.
2. Research needs

Research involving inter-laboratory testing programmes is constantly being carried out by various working groups in the committee prior to preparation of international standards. The research needs, including facilities and funding are provided by the representatives of member bodies in the programme.

3. Organization and structure

ISO/TC 45 is structured in a way to maximise achievement of its objectives. It has four sub-committees, which were originally working groups reporting directly to the parent committee. These working groups were given the sub-committee status when work involved had expanded and had become very specialized so that more attention could be focussed for the standardization of the aspects covered. ISO/TC 45 has two working groups reporting directly to it, that is the working group on terminology and the working group on environmental aspects.

Each of the sub committees (SC) is responsible in the development of its own standards. The SC shall evaluate the work programme regularly and action taken to revise and reprioritize the target as market evolves.

On-going personal networking and e-discussion is strongly encouraged among working group members in understanding national positions, existing governmental regulations/legislations and limitations.

4. Cooperation

In order to avoid duplication of efforts, ISO/TC 45 maintains liaison with other technical committees which deals with standardization of issues related to rubber and rubber products. In the field of terminology, liaison with ISO/TC 61 was established to reach a common standardized vocabulary.

ISO/TC 45 also maintains liaisons with external organizations related to the issues addressed by the committee. The list of liaison members is reviewed as and when necessary to ensure that liaison is established and maintained with committees or organizations where there really is a need. Liaison officers have been nominated whenever necessary.

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

1. Delays occur when there is reliance for progress in CEN for projects developed under the Vienna Agreement

2. The lack of time to spend on standardization work possesses a frequent problem for experts doing work on a part time and voluntary basis. Delays may arise from the late receipt of
the amended texts for progression to the next stage of development by the secretariat. The "slowing down effect" may give rise to the overall delay on the work of the TC/WG. Similarly, if too many projects are approved without proper justification and feasibility studies, resources to develop quality work will be lacking.

3. Within ISO/TC 45, delay has occurred due to lack of experts for particular projects. Work on these projects was delayed due to lack of an expert to help advance this document as an International Standard.

4. Some member bodies wishing to be represented have also indicated either a lack of technical expertise in their countries or a lack of consistent funding to sustain representation at meetings. In addition, the costs involved for delegates or expert participation in meetings are becoming prohibitive and this may lead to reduce level of participation.

5. The overall planning in the schedule of meetings may at times be problematic, in particular, countries having a small number of delegates who wish to participate in working group meetings that run concurrently. Due to the growing number of working group meetings, it is not always possible to arrange the overall timetable to avoid conflicts amongst experts sitting in the various subcommittees and working group meetings of interest to the member bodies.

6. Delays in standards developing process may sometimes be caused by ‘bottlenecked’ at the CS (such as the waiting time for the French translation) and not by the committee/secretariat.

7. The inability to progress a draft from one developmental stage to the next due to failure in securing copyright permission from the copyright owner.

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