The Cable Report 2015

The Industry and Market
for
Metallic Insulated Energy Cable
Bare Conductors
Superconductors
Metallic Communications Cable
Fibre Optic Cable
Winding Wire
Steel Wire Rope

Edition 2
April 2015

StatPlan Energy Ltd
1. ALL CABLE – ELECTRICAL CONDUCTORS AND MECHANICAL ROPE

Wires and cable perform two basic functions. 1) They conduct electricity or communications, for which they need high conductivity, or 2) They carry loads, for which they need high tensile strength. Sometimes they combine both requirements.

**Figure 1: Categories of rope, cable and conductor**

This report is primarily concerned with the market for electricity and communications conductors, both wire and cable. These have a total market of XXX million tonnes in 2014. There are three basic categories of energy and communications conductors; insulated cables, bare conductors or lines and fibre optical cable. Energy and communications conductors are primarily made of copper and to a less extent aluminium, and a small amount of the total are reinforced with steel for specific applications requiring higher tensile strength. XX% of cable is insulated electric cable in weight, XX% bare copper or aluminium electric conductor and XX% steel mechanical wire or rope.

**Figure 2: The total cable market, mechanical and electrical, 2013**

Source: Electrical cable in-house database, Mechanical cable Bridon
Figure 17: Geographical distribution of imports and exports
3.2. THE EUROPEAN ECONOMY
It could even impose more dramatic capital controls to prevent Russians from trading their roubles into other currencies. Russia could appeal to the IMF for assistance but there are two reason to think an international bailout is extremely unlikely. First, the IMF would have to agree to help a government still under intense sanctions for its annexation of Crimea. Second, Putin would have to accept the terms of an IMF leash.

4.1.3. MANUFACTURERS

Table 8: Russian cable manufacturers

Russia has a home grown cable industry built largely to supply the large electrical supply infrastructure.

- Uncomtech is the largest producer in Russia, has a technical agreement with Furukawa. It is the official representative for Irkutskabel and Kirskabel.
- Irkutskkabel owned by Uncomtech is one of the five largest cable makers in the Russian Federation. Irkutskabel started as a manufacture of bare aluminium and ACRS conductors for the Siberian and Far East transmission systems and has since then branched out into other product groups, such as power cables with paper-impregnated insulation rated at 1, 6, 10 kV.
- Kirskabel owned by Uncomtech ranks among the world top seven producers of mineral insulated cables (heat proof) and is the largest producer of bare conductors in Russia.
- Sevkabel Holdings was established in 1879 in Saint-Petersburg and is the oldest cable company in Russia. The Group has the third largest market share in Russia.
- Samara Cable Co was established in 1955 and produces 2/3 of all communication cables manufactured in Russia.
- Rybinskabel produced insulated aluminium power cable.
- Kamkabel produces MV XLPE cable
- Tchuvashkabel
- Nexans is building its first cable production facility Russia.

Figure 36: Market shares of cable accessory suppliers in Russia

Source: Federal Customs of Russia
6.1.2. ECONOMY

Figure 40: XXXXXXX consumption of wire and cable by product segment, 2000-2020, $ million
It is an interesting reflection of the reorganisation of the electro-technical industry in the late 1990s, that of the five giants that dominate the electrical industry globally - Siemens, GE, ABB, Alstom and Schneider - only one, ABB, retains an interest in cable and that is confined to the HV and submarine end of the market.

In Asia Fujikura and Furukawa are less than half of the size of Prysmian and Nexans but are focused more on telecoms and specifically optical fibre. Between them they have 12% of the global wire and cable market. The third largest, General Cable of the United States has 3%, about half the share of the number two in the market.

Table 17: The top global cable manufacturers by industry

<table>
<thead>
<tr>
<th>European companies</th>
<th>Utilities</th>
<th>Construction</th>
<th>Industry</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prysmian</td>
<td>21%</td>
<td>12%</td>
<td>Leader in all submarine applications with largest production capabilities. New leader in optical fibre cables.</td>
<td></td>
</tr>
<tr>
<td>Nexans</td>
<td></td>
<td></td>
<td>#1 in Europe interconnections, #1 building cables in France, #1 share in aerospace cables.</td>
<td></td>
</tr>
<tr>
<td>Leoni</td>
<td>60%</td>
<td></td>
<td>Leader in European automotive cables and also provides industrial, healthcare and communication cables.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>US companies</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>General Cable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southwire</td>
<td></td>
<td></td>
<td>LV, MV and HV cable, building cables and wire for automotive harnesses, electric motors and industrial equipment.</td>
<td></td>
</tr>
<tr>
<td>Belden Cable</td>
<td></td>
<td></td>
<td>Transmission solutions and communication systems for power plants,</td>
<td></td>
</tr>
<tr>
<td>Coleman Cable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Asian companies</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fujikura</td>
<td></td>
<td></td>
<td>The largest segment of group sales (c 50%) is copper cables, industrial cables and magnet wire.</td>
<td></td>
</tr>
</tbody>
</table>
13. WIRE AND CABLE MARKET DRIVERS

The final uses of wires and cables are so diverse that there are many drivers of demand. In this report we comment on the following categories:

- Transmission and Distribution for Electrical Supply – Insulated cables and bare conductors
- Railways – Insulated cables and bare conductors for dedicated T&D systems
- Telecoms – LV and telecoms cables
- Automotive sector – LV cable and wire harnesses
- Offshore OGT (oil, gas produces) and wind power sectors – EHV, HV and MV submarine cables and MV and LV topside wires and cables
- Construction

13.1. TRANSMISSION AND DISTRIBUTION IN THE ELECTRICAL SUPPLY INDUSTRY

Future demand for wire and cable in the T&D industry is driven by three factors; the need for further electrification in some regions of the world; development of the transmission sector in terms of capacity and length, for HV and MV cables, submarine cables and bare conductors; development of the distribution networks in terms of capacity and length, for MV and LV cables and bare conductors.

13.1.1. Electrification

The industrialised countries of the world are almost fully electrified although there are some off-grid isolated systems. However, in Sub-Saharan Africa and Southern Asia, notably the Indian sub-continent, there are large portions of the rural populations which have no access to electricity. Over the next forty to fifty years there will be a steady increase in electrification rates in these two continents, with increased demand for transmission and distribution cables, and subsequently for other product groups.

Figure 60: Electrification of the world
14.5. **COMMODITY PRICES**

Up to the late 1990s the prices of copper and aluminium were about the same as each other and fluctuated annually but around a linear upward trend. Aluminium has continued on this overall trend. The price of copper, however, went through the roof in 2004 with a rise of 61.1%, 28.4% in 2005 and 82.7% in 2006. In total the price increased by a factor of 4.96 between 2003 and 2011. This caused havoc with prices and delivery schedules for products with a high copper content, notably cables and transformers. The main reason was the huge expansion in demand in China.

**Figure 71: Prices of copper and aluminium 1960-2014**

The following chart, published by the IMF demonstrates the dominance of Chinese demand in the metals market. Although it is currently falling slightly it is premature to conclude that it is the start of a long term trend.

**Figure 72: World metal consumption**

Source: IMF World Economic Outlook, 2014
23. CABLE PROPERTIES

Wire, cable and rope have physical properties which distinguish them from each other and determine their suitability for particular applications. They help to determine not only which product type is best for a particular use but more specifically which sub-type will perform best in a particular situation. As a most basic example, a strong steel cable is required for a heavy duty crane, and its ability to conduct electricity is irrelevant, so high tensile strength but low conductivity is the guideline. At the opposite end of the spectrum, in a spacecraft strength is almost immaterial but conductivity and light weight are paramount.

Flexibility is another important characteristic. It does not matter in a stationary device but it is essential in a moving one, such as a robot.

The physical properties are mechanical and electrical. Generally, the higher the tensile strength the lower the conductivity and vice versa. Engineering decisions are therefore frequently a choice of the best compromise.

Conductivity is the most important property for electric conductors but mechanical properties matter, depending on the situation. Tensile strength is less important for some stationary electrical applications where the cable is supported along its length, such as an underground distribution line, but it is a crucial issue for applications like overhead high voltage power transmission conductors. These are large cross-section stranded cables of considerable weight strung between pylons which can be a kilometre apart. The cable must therefore be strong enough to support a weight of several tonnes and flexible enough to withstand high wind.

23.1. TENSILE STRENGTH

Ultimate tensile strength (UTS), often shortened to tensile strength (TS) or ultimate strength, is the maximum stress that a material can withstand while being stretched or pulled before failing or breaking. Three units are commonly used.

The most common units are the pascal and the newtons per millimetre. One pascal is defined as one newton per square meter. The practical units used are megapascals (million pascals) - MPa or - N/mm².

In the United States the customary unit is expressed as pounds (force) per right-angled inch (psi). The abbreviation ksi refers to "kips per square inch", or thousands of psi.

1 Megapascal [MPa] = 1 Newton/millimeter² [N/mm²] = 145.03773773 psi

Table 22: Tensile strength of selected materials

<table>
<thead>
<tr>
<th>Material</th>
<th>UTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel Mild-Maraging steel</td>
<td>841-2693 MPa</td>
</tr>
<tr>
<td>Stainless steel</td>
<td>860 MPa</td>
</tr>
<tr>
<td>Annealed iron</td>
<td>350 MPa</td>
</tr>
<tr>
<td>Annealed copper</td>
<td>210 MPa</td>
</tr>
<tr>
<td>Annealed aluminium</td>
<td>40-50 MPa</td>
</tr>
<tr>
<td>Aluminium alloy 6061-T6</td>
<td>483 MPa</td>
</tr>
</tbody>
</table>