

Global Expansion of Copper Rolled Product Business for Automotive Terminals and Connectors

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It has been 40 years since Kobe Steel's copper rolled product business first specialized in rolled-copper products for electrical and electronics applications, and a quarter century has passed since the company began actively developing business outside Japan. Five years ago, the company established a trilateral system for supplying rolled-copper products, the system consisting of three sites, one in Asia, another in North America and yet another in Europe. This paper reviews the history of the company's global business development up to date, analyzes the current issues on the basis of comparison with competing non-Japanese manufacturers of wrought copper and copper alloy products and describes the global business strategies, demand, and technical trends in the future. In developing rolled-copper products for electrical and electronics applications, including copper alloys for automotive terminals, it is believed to be important to follow the trends of automobiles, which are expected to be reborn as new mobility, and to acquire a high level of ability in responding quickly to rapidly changing user needs.

Introduction

Kobe Steel's copper rolled product business is about to reach 40 years since it first specialized in rolled-copper products for electrical and electric equipment, including copper alloys for automotive terminals. Also, approximately a quarter of a century has passed since the company began actively expanding outside Japan, in addition to the Japanese market. In this milestone year, this paper reviews the history of global development related to rolled-copper products for electrical and electronic applications such as copper alloys for automotive terminals and copper alloys for semiconductor lead frames. Also described is the outline of the strategy for global business development in the future.

1. Overview of global business development

1.1 Business development in Asia

The aluminum & copper business unit established Singapore Kobe PTE. LTD., the oldest site outside Japan for rolled-copper product business, in Singapore in 1976.

It originally started as a factory making copper pipes for hot-water supply and air conditioning,

and, in the 1990s, was quickly switched to supplying copper alloys for terminals and connectors, as well as manufacturing semiconductor lead frames, in anticipation of increasing demand for automotive terminals and semiconductors. The company began supplying copper alloys for electronic parts.

Later, in order to respond to the demand for automotive terminals and semiconductor lead frames, which were increasing rapidly in the Asia, Kobe Steel established slitting centers in Thailand and China to build a material supply system in the areas closer to customers. These centers are notable for the fact that each not only functions as a site for manufacturing products with slit widths, but also has the technical service function of operating as a sales site close to customers.

In Thailand, the slitter business began in 2001 when Kobe Electronics Material (Thailand) Co., Ltd. was established and, in China, the business began in 2005 when Suzhou Kobe Copper Technology, Co., Ltd. was established. The combined throughput capacity of both the companies has expanded to approximately 2,000 tonnes/month, which accounts for approximately 40% of the capacity of the copper-rolling plant of Kobe Steel's Chofu Works.

1.2 Business development in Europe and US

Direct export of rolled-copper products from Kobe Steel to Europe or to North America is very disadvantageous in terms of cost and delivery. Hence, a local supply system has been established by entrusting the production of Kobe Steel's original alloys to European manufacturers of wrought copper and copper alloy (hereinafter referred to as "wrought copper").

The business began with licensing KFC[®] Note 1) and KLF[®] Note 2)-5 to Trefimetaux, a French wrought copper manufacturer, in 1986. Trefimetaux was later merged into KME, and this license has now been dissolved.

In the early 1990s, the trade frictions between Japan and the U.S. intensified with the emergence of "Buy Americanism." In response to this trend,

Note 1) KFC is a trademark of Kobe Steel registered in the USA.

Note 2) KLF is a trademark of Kobe Steel registered in the USA.

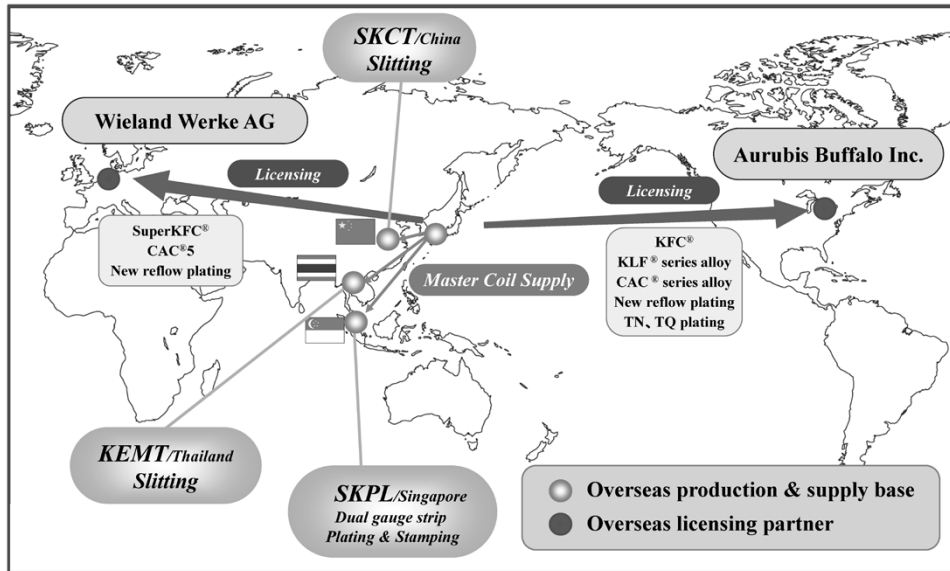


Fig. 1 Global supply system of copper rolled products

Japanese automakers switched their policy from exporting from Japan to producing in the U.S. Then, following automakers, the manufacturers of automotive harnesses, terminals, and connectors also shifted their production to North America. As a result, there was also a strong demand for local supply of rolled-copper products.

Hence, the copper sheet business unit began searching for licensees in North America in 1992 to establish a licensed supply system. There were, however, problems, such as the fact that no agreement was reached with any leading U.S. wrought copper manufacturers, while no small-and-medium-sized manufacturers had enough technology and equipment to produce Kobe Steel's products, including KFC® and KLF®-5.

The licensing in North America began to progress in 1995 when a major Japanese customer made a match between Kobe Steel and Outokumpu American Brass (hereinafter referred to as "OAB"). There also was a difficulty in certifying the change of the license at the time of product transfer to OAB's Buffalo Factory following the closure of its Kenosha Factory in 1998. This significantly delayed the acquisition of customer's certification after the license agreement was signed.

There were many twists and turns, such as dispatching Japanese experts to resolve this issue, and it took until 2001 before both bare material and tin-plated products were produced. After that, the capital of OAB was transferred to Luvata and then to Aurubis, but still, a favorable relationship continues with Kobe Steel.

The menu of licensed products has been expanded and new plating technology, such as new reflowed plating, has been provided. As a result, the

production volume has grown to over 500 tonnes/month, equivalent to 10% of the capacity of Kobe Steel's copper rolling plant. It has been decided that the products will be supplied to several major Japanese and American customers in the future, and further scale up is expected.

1.3 Establishment of trilateral supply system

The preceding sections have described the establishment of the supply system in Asia and North America. On the other hand, supply in Europe was stagnant due to the merger of Trefimetaux. However, major harness makers and terminal/connector manufacturers eagerly desired trilateral material supply in Europe, Asia, and North America, and licensees in Europe were continuously sought.

Although not having to do with the rolled-copper products, there was a joint venture relationship between Wieland-Werke AG and the copper pipe business of Kobe Steel in the 2000s. As a result of aiming to build a relationship extended from the alliance in the copper pipe business, Kobe Steel signed a license agreement with Wieland on strategic products, namely SuperKFC®^{Note 3)} and CAC®^{Note 4)} 5, and new reflowed plating, which paved the way to supplying to Europe.

Beginning in 2009, the supply system was gradually established, and in 2014, the establishment of the trilateral supply system, the final target, was completed. Fig. 1 shows the global supply system,

Note 3) SuperKFC is a trademark of Kobe Steel registered in the USA.

Note 4) CAC is a trademark of Kobe Steel registered in the USA.

then established, of Kobe Steel's rolled-copper products. The global supply system of rolled-copper products for automotive terminals and connectors was materialized at this time, meeting customers' demands.

2. Comparison with wrought copper manufacturers of the world

2.1 Features of wrought copper manufacturers in U.S. and Europe

High performance rolled-copper products used for automotive terminals and connectors have been produced by the world's leading modern wrought copper manufacturers. Most of them exist in Europe, the United States, and Japan, but U.S. and European wrought copper manufacturers have followed a transition different from that of Japanese manufacturers, including Kobe Steel. Especially after the EU integration, U.S. and European wrought copper manufacturers have been strengthening corporate foundations in accordance with trade liberalization in the region and pursuing equipment systems that earn by volume by seeking efficient operation and economies of scale through corporate integration. The end result is that Europe in the 1990s had more than 40 wrought copper manufacturers with a production volume of 10,000 to 20,000 tonnes/year, but in 2010, after the EU integration, they were consolidated into a few giant companies with production capacities of over 100,000 tonnes/year. Representative wrought copper manufacturers include: the KME group, having

sites in Germany, France, Italy, the UK, Spain, etc.; Wieland-Werke AG, also having sites in Germany and UK and Austria; and Aurubis AG, having sites in Finland, the Netherlands, Sweden, Belgium, etc. U.S. manufacturers have also been integrated around Olin Brass.

These giant companies have also expanded into Asia, competing with Kobe Steel in rolled-copper products for automotive terminals & connectors and rolled-copper products for semiconductor lead frames.¹⁾

2.2 Features of Chinese wrought copper manufacturers

Since the late 2000s, Chinese wrought copper manufacturers have been rapidly expanding their scale of business. Like European and U.S. wrought copper manufacturers, they are pursuing the economies of scale through expansion, and their technology and equipment have been acquired from European manufacturers. Several companies are rapidly growing, including Chinalco Copper, a copper business division of Aluminum Corporation of China Ltd. (CHALCO).²⁾

3. Kobe Steel's global strategy

Kobe Steel has a history of developing many high-performance copper alloys that meet customers' needs. Fig. 2 shows the development history of Kobe Steel's rolled-copper products. The company has specialized in automobile and electronics fields and developed, among other

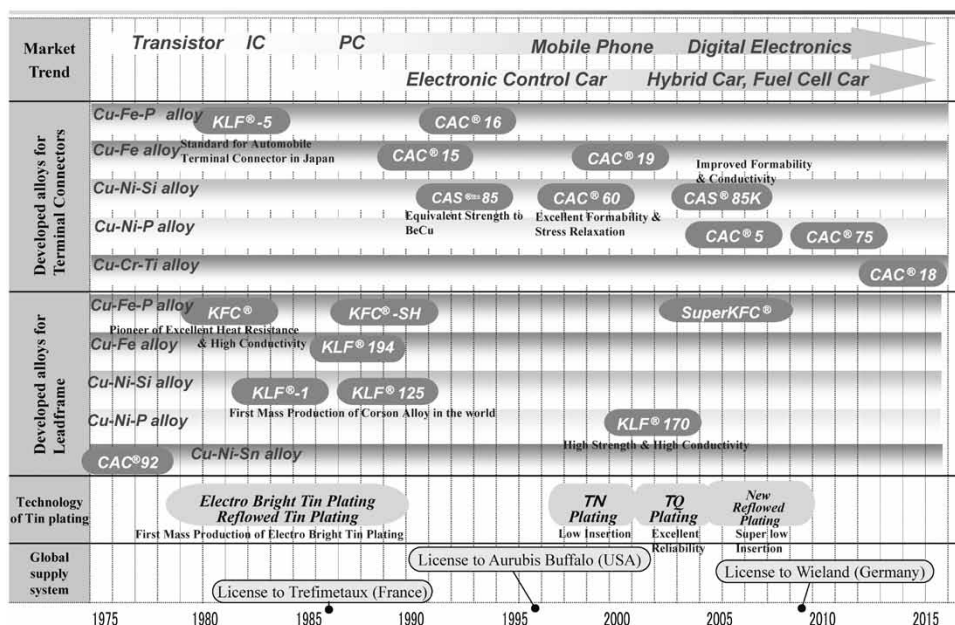


Fig. 2 History of development of rolled copper products

products, copper alloys for automotive terminals, tin plating technology, and copper alloys for semiconductor lead frames. Starting with KFC[®], developed in the 1980s, the KLF[®] series, CAC[®] series, low insertion tin plating, and other new alloys and new products were released into the world market in the 1990s and 2000s. Since 2000, these newly developed alloys have accounted for more than 75% of the company's production. Considering that the ratio of new alloys does not exceed 40% for other wrought copper manufacturers such as European, American, Chinese, Korean, and including Japanese manufacturers, Kobe Steel can be regarded as a very unique company. Hence, in order to supply niche products on a global scale, Kobe Steel signed a license agreement with two giant companies, Aurubis and Wieland, as mentioned in the previous section. Kobe Steel has formed a global alliance that can be called a technology league by entrusting the production of newly developed original copper alloys.

Meanwhile, Kobe Steel has responded to customers' demands in the automobile and electronics fields, as mentioned above. In other words, the company has gained high evaluation outside Japan by supplying the market with copper alloys and tin plating, which can be called special materials with superior functions, as well as rolled-copper products with high level surface quality. Kobe Steel's strategy is to work with customers to supply highly functional rolled-copper products that cannot be developed or supplied by non-Japanese manufacturers, which is particularly in tune with the global development of Japanese automakers and semiconductor manufacturers, and the superiority of this strategy has been demonstrated even outside Japan.

Kobe Steel's superiority has been recognized, especially in the field of automobiles, but now that automakers themselves are integrating their business through cross-border technical collaboration and M&A, it is considered to be becoming necessary to review the business model followed up until now.

So far, Kobe Steel has supplied new/improved products to the market through technical exchanges with Japanese parts manufacturers. As the market for Japanese parts manufacturers and automakers has expanded, Kobe Steel's rolled-copper products have spread worldwide, and hitherto, this has been the company's business style.

Now, one hundred years after the birth of the automobile, a tremendous change is about to take place, and the above approach may not be in line with the prediction that a new mobility society will prevail worldwide. On the other hand, however,

it is considered not appropriate for Kobe Steel to change its approach to "pursuing the economies of scale," as is sought by the wrought copper manufacturers in Europe, the U.S., and China. It will be difficult for these wrought copper manufacturers, which have grown so big, to deal with the situation where automakers are involved in mergers and alliances every year. Giant wrought copper manufacturers may not have the agility to deal with technical exchanges and development at the speed required by customers such as automakers and parts manufacturers.

The future path that Kobe Steel should seek is to acquire a high technological competence capable of communicating equally with automakers, while automakers are required to respond to global changes in the following three points: namely (1) response to diversification of the power train, which is being promoted as a countermeasure to environmental problems; (2) response to automobile intelligence, IoT, and automated driving; and (3) response to changing consumer needs, from owning automobiles to renting.

Thirty years ago, when KFC[®] and KLF[®]-5 were developed, Kobe Steel was able to make direct proposals by developing copper alloys with the required characteristics found through interactions with automakers, the final customers for rolled-copper products. Since the bursting of the bubble, however, the conduit with automakers has become narrower, limiting the technical exchanges to those with Japanese manufacturers of terminals/connectors and harnesses, who are the direct customers. Hence, Kobe Steel believes in the future strategy of establishing a high technological competence enabling strong interaction with automakers and the making of proposal-based improvements.

It is not enough to interact only with Japanese parts manufacturers and automakers. It is also important to create an environment that allows interactions with non-Japanese parts manufacturers and automakers. In such cases, product groups that have not become de facto standard, such as Kobe Steel's CAC[®] series alloys, may become obstacles. Outside Japan, even copper alloys are often commoditized, and the standard alloys that are not in the menu of Kobe Steel's rolled-copper products should be added to the menu.

Conclusions

Kobe Steel estimates that, in Japan, its share of the copper alloys for automotive terminals and connectors exceeds 30%. The market where sales

are expected to grow in the future is the market outside Japan. Hence, it is important to develop a global supply system as well as to acquire the high technological competence and proposal power described above. It is also necessary to expand the Asian sites and increase their market share in response to the increasing demand in the Asia region, which is a direct market for Kobe Steel. Therefore, Kobe Steel is striving to expand the spread of KOBELCO brand rolled-copper products by constructing a system for increasing sales volume in emerging countries such as China, Vietnam, and Indonesia, where large growth can be expected.

References

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