

T I C

TANTALUM-NIOBIUM INTERNATIONAL STUDY CENTER

PRESIDENT'S LETTER

The half yearly meeting of the Executive Committee was held in Brussels on April 27th. All Committee members attended in person except Tom Odle who was represented by Mike Fisher.

The plans for the Fortieth General Assembly in Perth were confirmed for October 24th-26th, with a good programme of papers to be presented on the 25th (see below).

The year 2000 will see the T.I.C. host a symposium in San Francisco. A booking has been made at the Grand Hyatt Hotel for October 22nd-25th 2000.

Charles Culbertson accepted the position of Chairman of the Organising Committee and, together with Harry Stuart, will co-opt other Committee members. The event is expected to last three days, with papers covering all aspects of the industry. Charles and Harry would be happy to receive ideas or nominations for papers to be presented.

The T.I.C. has received a total of 10 applications for the position of Technical Promotion Officer and these are in the process of being evaluated. The Committee has reduced the list of suitable applicants to four and expects to make a decision before the October meeting.

Roskill Information Services have supplied a free copy of The Economics of Tantalum (seventh edition) with the request that the T.I.C. review and comment on the report. Sections of the report will be distributed to certain members who will be requested to critically review the information and report back to the T.I.C. in order to collate the responses.

We have also been requested to prepare a chapter on tantalum for the 'Chemical Handbook' and we will be seeking volunteers from member companies to help prepare this information.

Axel Hoppe has agreed to form a sub-committee of members to examine the best way to respond to the European Union request for toxicological information on tantalum.

Statistics collection is still an issue, particularly with the response time needed by some member companies. All companies are asked to return the information promptly so that results can be distributed to member companies in a timely manner.

Hope to see you all in Perth in October.

John Linden
President

PERTH, OCTOBER 1999

Fortieth General Assembly and associated meeting October 24th-26th 1999

In 1999, the Tantalum-Niobium International Study Center will make its third visit to Perth for a General Assembly. The local member and host company Sons of Gwalia, like its predecessor Greenbushes Tin, has continued to develop so that on each occasion there has been a fascinating mining enterprise to visit.

The General Assembly and technical sessions of this conference will be held at the Burswood International Resort Casino, and delegates will also have rooms at this hotel. Only recently built, the Burswood has numerous restaurants and bars, a golf course, swimming pool, tennis courts, a gym and health centre for the entertainment and care of the delegates while they relax. The hotel overlooks the Swan River and is only a few minutes from the airport.

On Sunday October 24th the registration desk will be open during the day. In the evening the T.I.C. invites all participants to the welcome reception at the poolside from 6 to 8p.m.

The Fortieth General Assembly of the association will open the programme on Monday October 25th. Guests from non-member companies will join the members for the technical sessions, continuing until 5p.m., with a break for lunch. Presentations will focus on raw materials production, as our host is a mining company, but will not be limited to this field only – see list of papers below.

A gala dinner at the Lake Karrinyup Country Club will be hosted by Sons of Gwalia in the evening. If you were in any doubt that you were in Australia, you will be sure when you see kangaroos wandering on the greens of the golf course...

There will be a choice of plant tours on Tuesday October 26th: participants may select either a trip to see the Wodgina mine, or a tour of the new developments at the Greenbushes operation.

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The former will involve a two-hour flight to Port Hedland, followed by a drive to reach the mine site, where temperatures may reach 30°C, but visitors will be rewarded by a tour of a mine under constant development. The trip to Greenbushes will be less rigorous, with a three-hour drive each way and cooler temperatures, but viewing the recent expansion of the mine will be no less exciting.

Attractive sightseeing tours and entertainment for those accompanying the delegates will be arranged. On Tuesday there will be a full day boat trip up the Swan River to have lunch at a Swan Valley vineyard.

Invitations will be sent to the nominated delegates of member companies. Anyone else interested in attending should contact the T.I.C. without delay. ■

SYMPOSIUM IN 2000

The next International Symposium on Tantalum and Niobium will be held in 2000. The conference will be at the Grand Hyatt Hotel in San Francisco from October 22nd to 25th.

Mr Charles Culbertson of Kemet is heading the organising committee, and would be glad to hear from potential speakers who would like to deliver a presentation at the Symposium. Those who would be interested in further information on attending should also contact the T.I.C. – member companies will receive invitations as usual.

The T.I.C. held Symposia in Rothenburg-ob-der-Tauber, Orlando and Goslar, and all three events were very well received, so we look forward to further success.



Burswood

TECHNICAL PROGRAMME

The sessions are expected to include the following, closing with the panel discussion:

Production expansion at Greenbushes and Wodgina tantalum mines

by Mr David Bale, General Manager – Minerals Division
Sons of Gwalia Ltd

Supply and availability of low grade slags in S E Asia

by Mr Yeap Soon Sit, Managing Director
SA Minerals

Production of niobium and tantalum from the Pitinga hard rock tin mine

by Mr Jorge Jose Correia Salles, Marketing and Strategic Planning Manager
Paranapanema

New developments in powder technology

by Mr Tomoo Izumi, Manager R&D
Showa Cabot Supermetals

Production of superalloys in Western Australia

by Mr Kyle Abbott, Managing Director
Western Australian Specialty Alloys

Niobium in special applications

by Mr Tadeu Carneiro and Dr Harry Stuart
Reference Metals Company Inc

The role of tantalum capacitors in mobile telephony

by Mr Soren Kjaer, Component Engineer, Research & Development, Copenhagen, and Ms Merja Kangas, Component Engineer, Passive Components, Salo, Finland
Nokia Mobile Phones

Panel discussion: Structure and future

Mr Peter Lalor, CEO, Sons of Gwalia Ltd
Mr Peter Kahlert, H C Starck GmbH & Co KG
Mr Kennett Burnes, Cabot Corporation

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TECHNICAL AND COMMERCIAL DEVELOPMENT OF THE EUROPEAN NIOBIUM MARKET

by Dr Friedrich Heisterkamp, Niobium Products GmbH,
and Mr Tadeu Carneiro, Reference Metals, both companies
in the CBMM group.

Presented to the T.I.C. meeting in October 1998.

ABSTRACT

The technical development of niobium-containing products is to a great extent influenced and supported by the efforts of the respective industries to maintain or even strengthen their position in all fields of application against competing materials. The aircraft industry is increasingly using niobium-containing nickel-base alloys and is expected to continue long term its present high output of passenger planes. Eastern Europe and the CIS are slowly coming back to normal economic conditions and are already applying western technology in their steel and metals industries. As a result, the niobium market was very strong last year and it is likely to remain so in the foreseeable future. The latest research and development in the field of niobium-containing steels and alloys, which lead to strong demand in the past few years, will be discussed.

HISTORY

The emergence of niobium as a widely used industrial metal in the second half of this century is directly related to outstanding results in the technical development of alloys for the steel, aircraft and electrical industries. Its commercial importance is expressed by the ratio of its application, a difference of two orders of magnitude is involved:

Steel:superalloys:metal = 100:10:1.

Steel: The technical breakthrough came in the 1960's with the introduction of niobium as the most important microalloying element in steel, due to its unique feature of retardation of austenite recrystallisation. In this respect it is incomparably better than any other known microalloying element such as vanadium, titanium and aluminium.

Superalloys: Efforts to economise in the use of the widely used cobalt-containing superalloys in the 1960's and early 1970's led to development of nickel-based alloys which made use of the group VB and VIB elements, e.g. niobium, as a strengthener in solid solutions, as coherent phase and as carbides.

Metal: For decades niobium metal and alloys have been used in industry for a variety of applications based on their corrosion resistance and high temperature properties. With the discovery that niobium has the highest critical temperature, T_c , of all superconducting metals, and as NbTi is the only commercially relevant ductile alloy for technical superconductors, the importance of niobium as a technical metal grew further.

MARKET

General

In 1997 the world niobium market exceeded for the first time the 20 000 tonnes level. Continuing growth will lead in 1998 to a consumption of more than 22 500 tonnes Nb-contained, of which Europe will use more than 7000 tonnes, see Figure 1.

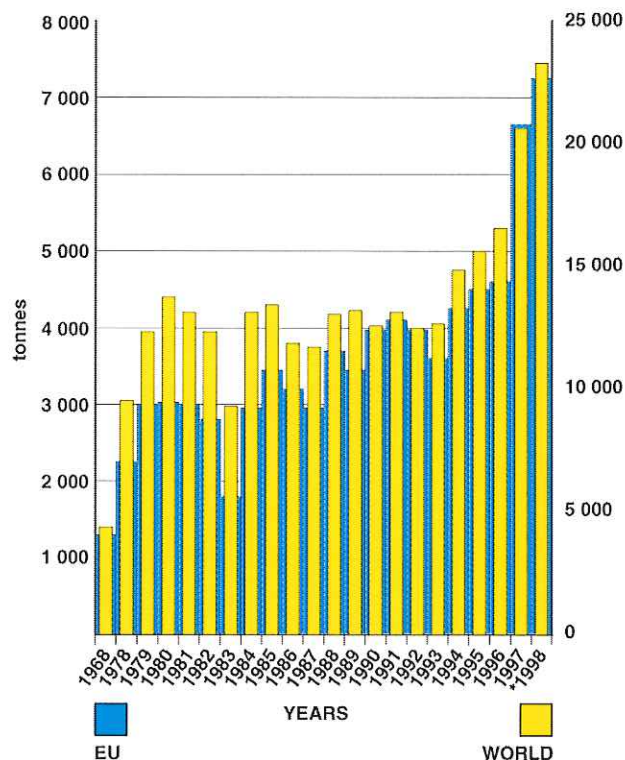


Fig. 1: Niobium consumption in Europe and the world (tonnes Nb contained)

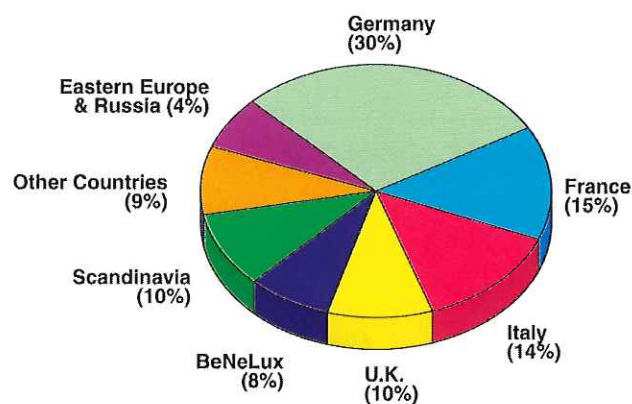


Fig. 2: Distribution of niobium consumption in Europe, 1997

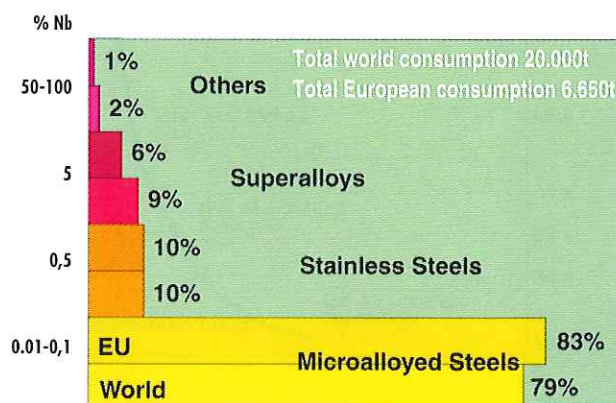


Fig. 3: Main application areas for niobium 1997:
Total consumption in Europe 6650t, in the world 20 600t

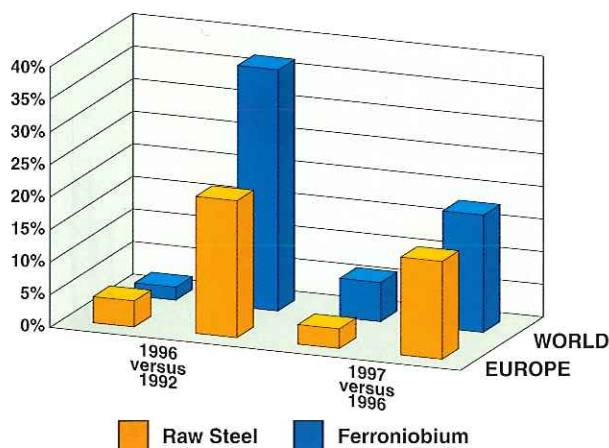


Figure 4: Comparison of raw steel production and ferro-niobium consumption

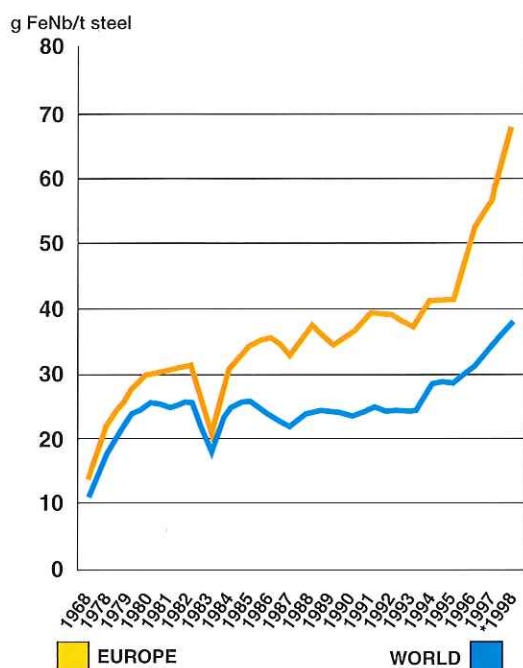


Fig. 5: Specific FeNb consumption in Europe and in the world

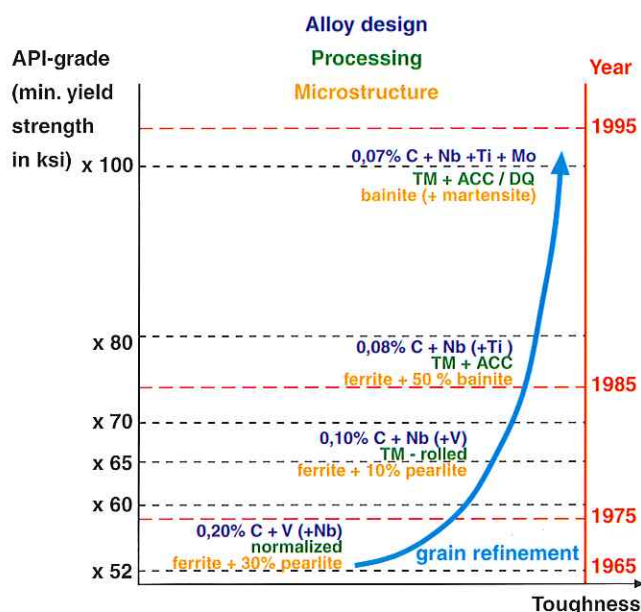


Fig. 6: Developments in high strength line pipe steel

In Europe growth was fairly consistent over the last 20 years, whereas the world total showed periods of stagnation. By geographical areas, for 1997 Europe (EU) and North America were practically equal, 37% and 36% respectively, and by far the most important consumers; Japan with its 20% share is lagging behind, and the rest of the world consumed only 7%. Within Europe (see figure 2), Germany is the major user, followed by France, Italy, United Kingdom and Scandinavia. This situation is due to the fact that these countries have by far the most modern and highly developed steel industries, with very sophisticated consumers nearby.

Comparing the main technical applications in Europe and in the world in general, some differences appear (see figure 3). Microalloyed steel is by far the most important application for niobium: including stainless steel, it amounted to 89% in 1997 in the whole world, and even more, 93%, in Europe. For superalloys, niobium use is substantially higher in North America than in Europe because of the leading aircraft industry. The figure also shows that the higher the niobium content, the lower the amount of niobium used. However, the added value increases as the niobium product becomes more sophisticated.

NIOBIUM IN STEEL

Market

With regard to niobium applications in the European steel industry, there are basically three major areas: steels for pipelines, for the automotive industry and for structural applications. Stainless steel is steadily 10%, whereas IF-steel is a new application and although it is still small it has potential for growth, as can be concluded from the Japanese and North American markets which have high demand for niobium in IF steels. The higher the carbon content of a steel grade, the less the advantage of niobium metallurgy: therefore the important field of tool and engineering steels consumes little niobium, only 8%.

Pipes (plate, strip)	29%
Structural (plate, strip, shapes)	28%
Automotive (strip, sheet)	23%
Stainless	10%
Other (tool steels, engineering steels, etc.)	8%
IF-steel	2%

Table 1: Applications of ferro-niobium by steel products, 1997 (93% of total niobium consumption)

The fact that niobium is up to 93% applied in the European steel industry does not mean that future growth potential depends solely on the fate of this industry. In 1990 the growth rate of niobium in steel was higher for niobium than for steel production. For the entire world, this difference in growth rate was even greater.

The technical penetration of the steel industry by niobium metallurgy is best reflected in data for specific consumption of ferro-niobium over the last 30 years. In this context specific consumption means the total consumption of niobium in steel divided by the total steel production of the area considered, expressed in grammes FeNb per tonne of steel. Figure 5 shows that this index number is steadily increasing in Europe for the last 30 years and is very pronounced over the last 4 years; it is today twice the world average, and in North America the situation is similar.

TECHNICAL DEVELOPMENT

Ten years ago the main application for niobium in the steel industry was for pipeline steel (see table 2). At that time almost 60% of the total European market for niobium was consumed in this area. The main reason for this development was the introduction of niobium metallurgy, that is, the combination of alloying with niobium and thermomechanical processing. This brought in properties not achieved by any other means, and which were so advantageous for the pipeline industry that the technology was introduced immediately, even during its development, some 25 years ago.

In the meantime niobium metallurgy has also been successfully applied in other fields, particularly in the automotive industry and in the steel construction industry. Therefore consumption in these industries grew substantially over the last 10 years. Even though the absolute consumption of niobium in pipeline steels remained fairly constant, its relative importance decreased. Since niobium found its way into the new areas mentioned above, total consumption in Europe almost doubled.

The combination of niobium microalloying and controlled rolling is the only means of increasing both strength and toughness of steel simultaneously, due to the grain refining effect. Figure 6 shows this development for pipe steels over the last 30 years. Today pipe steels with twice the strength and also with better toughness can be produced through:

- reduction of the carbon content,
- addition of niobium (possibly in combination with other elements),
- introduction of controlled rolling, later on in combination with accelerated cooling,

	1987	1992	1997
Pipe, plate & strip	59%	31%	29%
Structural plate, strip, sheet & shapes	12%	27%	28%
Automotive strip, sheet & IF	10%	18%	25%
Stainless	13%	17%	10%
Others	6%	7%	8%
Total tonnes	5300	6100	10000

all due to enhanced grain refinement.

Table 2: Changes in FeNb applications in Europe, 1987-1997

The application of niobium steels in the automotive industry has also made remarkable progress recently, in particular with the introduction of so-called tailored blanks (see figure 8). In a tailored blank, sheets of various thicknesses and strength levels are combined by laser welding. This technique has made it possible for the first time to position high strength material in those areas of an automotive part where strength is required, and on the other hand to put low strength material into a position where good formability is necessary. The use of tailored blanks has substantially increased in the last five years (see figure 9) and it is expected to grow even faster in the years to come, due to its obvious advantages. Moreover, the results of the ULSAB (ultra light steel automotive body) project show (see figure 10) that in the future more than 90% of the steel used in the body of a car will be high strength steel, and more than 50% will be microalloyed. All the microalloyed grades will contain niobium. The relevant forming processes are also being developed.

In the construction industry the use of higher strength material leads to substantial savings, as outlined in figure 11.



Fig. 7: Pipe laying in Russia – alloying with niobium is essential for pipelines in a cold climate

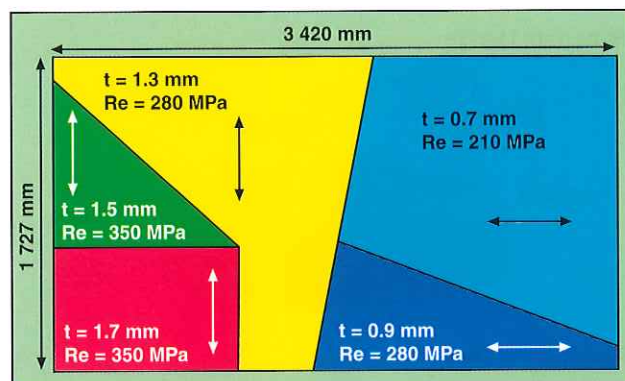


Fig. 8: Automotive application: tailored blank for the side panel of ULSAB project

Compared with mild steel, the material costs are reduced to 60%, the weight of the construction to 40% and the weld metal volume to 25%. The combination of all these advantages makes construction with high strength steel more economical and hence more competitive.

In the development of microalloyed steels the reduction of carbon, nitrogen and sulphur was a pre-requisite. For the grade of steel which in 1960 had an average carbon content of 0.21%, the average now is 0.09%, and for a new group of steels the content is as low as 20 ppm. In mass production, steels allowed a maximum of 8 ppm of sulphur are no longer a problem. As a result, the weldability of steel, which is a major cost factor, has been improved, the properties of the welding are better and the construction has become safer.

MEMBER COMPANY NEWS

Stop press !

Kemet Corporation announced on June 23rd 1999 that Mr Charles Culbertson II had been named President and Chief Operating Officer of the company.

Mr Culbertson is Kemet's delegate to the T.I.C. and a member of the Executive Committee.

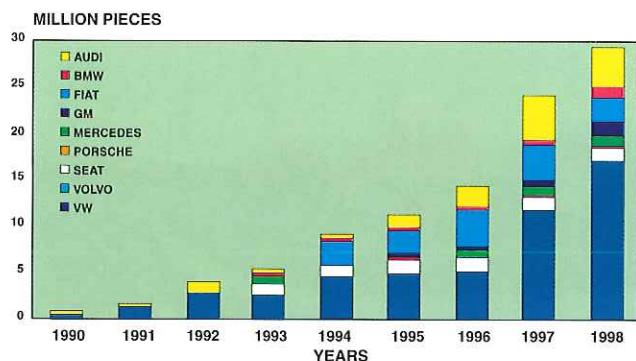
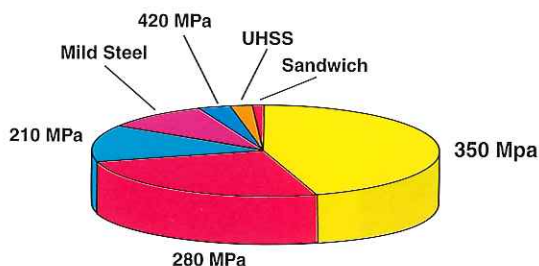


Fig. 9: Use of tailored blanks in the European automotive industry (million pieces)

Materials Usage



Forming Process

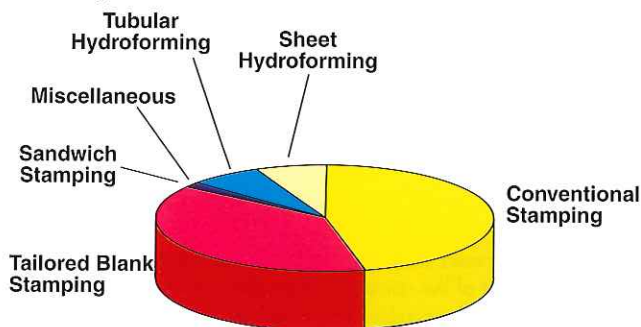


Fig. 10: Result of the ULSAB project

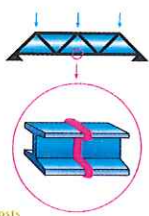
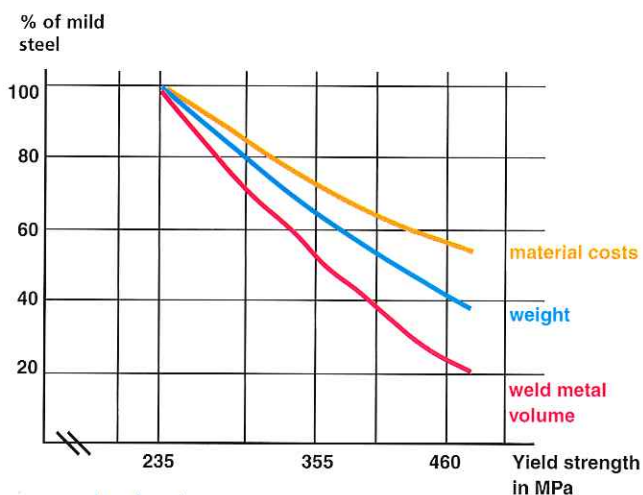


Fig. 11: Savings in construction costs with high strength steels

NIOBIUM IN SUPERALLOYS

Market and technical development

Superalloys represent worldwide the second largest use for niobium outside the steel industry. There are literally scores of different superalloys used in a variety of high temperature applications or in corrosive environments. However, the single most important member of the class is Inconel 718, a nickel-base alloy containing 5.3-5.5wt% niobium. This alloy forms the backbone of commercial and military jet engine manufacture.

Although the main demand for Inconel 718 and other niobium-containing superalloys still comes from aircraft engine builders, new uses for these alloys have been developed in other areas, such as the nuclear, cryogenic, automotive and petrochemical industries. Land-based turbines for electricity generation are becoming increasingly important: the efficiencies of these machines are being increased, in combination with conventional power plants, to acceptable levels of 56-58% by increasing operating temperatures.

	World	Europe
Aerospace, jet turbine engines	1150	210
Land-based turbines	285	20
Other (high and low temperature applications, corrosive environments)	465	120
Total	1900	350

Table 3: Market for niobium in superalloys, 1997 (in tonnes Nb contained)

An overview of the world and European markets is presented in table 3. Approximately 2800 tonnes of niobium oxide equivalent were consumed worldwide by the superalloys industry in 1997. A very similar amount is expected to be consumed in 1998. It is estimated that some 60% of all niobium-containing superalloys production is associated with aerospace and aircraft turbines. Land-based turbines account for some 15% of the total. The balance of approximately 25% is used in a variety of applications as indicated.

Table 3 also shows the market pattern for Europe. The total consumption in Europe reaches approximately 20% of the niobium used in superalloys in the whole world. North America, with its dominant space and aircraft industry, is responsible for 70% of the total demand and other regions of the world for the remaining 10%.

Although superalloys are being increasingly used in other industries, the consumption of niobium in superalloys in the next ten years will be extremely dependent on the market for aircraft engines. Figure 12 presents a forecast for the world's aircraft deliveries in the next decade. The forecast shows that some 14 000 aircraft of all types will be delivered worldwide in the next ten years, distributed cyclically around a trend line of positive growth equal to 2% per year. Therefore, in line with these delivery peaks, the total demand for niobium may also show peaks as high as 4000 tonnes niobium pentoxide per year.

Technological changes in aircraft engines do not happen overnight. Thus it is expected that nickel-base superalloys and in particular the alloy 718, which account for 40 to 50% of engine weight, will continue to be the materials of choice in the near future as shown in figure 13. Higher temperature capability and lower density remain the twin pre-requisites in potential engine building materials. Alloy 718 is now operating at a temperature equivalent to 85% of its melting point. It is

clear, therefore, that the melting point of nickel imposes a natural ceiling to the potential for improvement of this alloy. One of the most important potential materials with higher temperature capability than alloy 718 is a niobium-containing gamma titanium aluminide. Therefore niobium should remain an important element of choice for these applications even for the long-term future.

NIOBIUM METAL, ALLOYS AND SPECIAL PRODUCTS

Market and technical development

This market is more difficult to understand due to its specific nature, relatively small size and the inconclusive information available. In contrast to the steel and superalloy data, the presented figures give an overview only.

The total demand for niobium metal and niobium-based alloys in recent years has varied from 400 to 500 tonnes of niobium in ingot form. Magnetic Resonance Imaging (MRI) used in medical diagnostics and Nuclear Magnetic Resonance used in spectrographic (analytical) applications are the two commercial applications for niobium as superconductor material which account for the majority of this demand.

Some other applications of niobium metals and niobium-based alloys include their use as:

- refractory material for aerospace applications such as the alloy Nb-Hf-Ti used in rocket thrusters and rocket nozzles;
- precision support members in high-efficiency and high-intensity sodium vapour lamps (niobium-1wt% zirconium);
- alloying element for zirconium in thin wall sections of nuclear reactors of the CANDU type;
- sputtering targets used in the architectural glass industry, for razor blades and in the electronic industry;
- niobium-titanium alloys, used in the mining industry in contact with corrosive vapour phases and particles from slurries, and for surgical implants;
- platinised anodes for cathodic protection.

In addition, the market for niobium will increase during the next three or four years due to the demand imposed by the Large Hadron Collider under construction in Europe. This particle accelerator will consume approximately 400 tonnes of niobium-titanium billets for the manufacture of the superconducting cables used in the magnets.

High purity niobium oxide with different impurity levels is used in fine ceramics, for optical applications and, to a much lesser degree, for electronic uses. The total world market is thought to be around 400 to 500t of oxide, of which 300t are consumed in Japan, the rest in North America and Europe.

In Japan 50% is for functional ceramics, e.g. condensers, actuators, etc., 45% for optical lenses and a small part, about 5%, for lithium niobate single crystals for acoustic wave devices in TV sets.

ROSKILL: THE ECONOMICS OF TANTALUM 1999

This new edition of The Economics of Tantalum was released by Roskill in February 1999. The T.I.C. has been given a copy by Roskill for its library, with the request that the T.I.C. advise its members that the report is available from Roskill Information Services Ltd., 2 Clapham Road, London SW9 0JA.

The T.I.C. Committee is in the process of reviewing the document with a view to updating the information wherever possible. Different members of the T.I.C. are being asked to review certain sections of the report where their company's activities are listed.

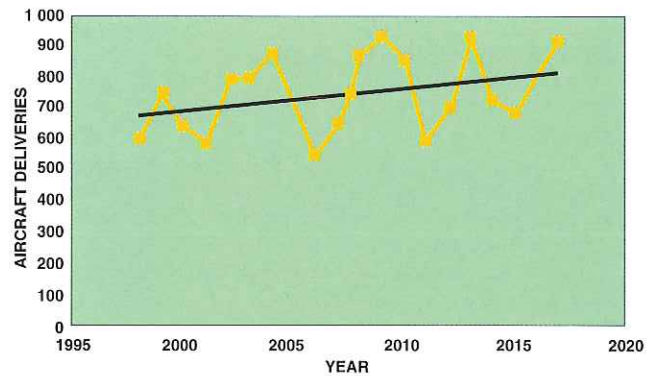


Fig. 12: Aircraft deliveries - total world -
Pratt & Whitney forecast

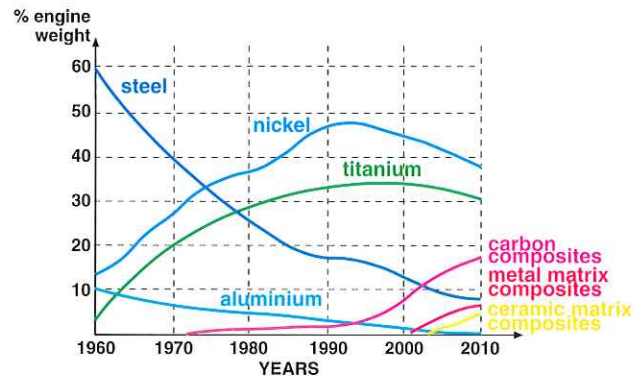


Fig. 13: Evolution of materials in aero gas turbines

In Europe and North America the main application is for optical purposes.

CONCLUSION

The metal niobium has developed over the last 30 years from a negligible entity into a widely used technical metal. The main breakthrough in volume use came with the introduction of niobium as an alloying element in high strength steels and in superalloys. Technical development in these areas indicates that all the technical merits of this metal have not yet been exhausted. So far no disadvantages have become apparent, so growth in consumption can be expected to continue as far as world economy permits. Regarding the perspectives for niobium metal, alloys and special oxides, it can be anticipated that their application possibilities are not yet fully used and the abundant availability of raw material will generate new ideas. To foster further development, time, effort and funds must be devoted to research. ■

The report is a good historical document of the tantalum industry and quotes extensively from T.I.C. published statistics.

The main criticism of the report is that much of the numerical and statistical data is more than 12 months old and, in some cases, up to 2 years old.

The other criticism of the report is that statements once included in earlier editions of the report do not seem to be edited out, even though some of the information is more than 10 years old and in some cases is insignificant.

Having said that, the report is an essential library reference for anybody who is in the tantalum industry and a 'must read' for anybody thinking about getting into the tantalum industry.

MEMBER COMPANY NEWS

Cambior

The annual report for 1998 for Cambior shows the company's share of production was 1 091 tonnes of niobium in ferroniobium, the same level as in 1997. In 1998, the Niobec mine processed a total of 819 000 tonnes with a grade of 0.69% Nb₂O₅. The pyrochlore was converted into ferroniobium using the converter installed in 1995.

The Niobec mine, located in north-eastern Quebec, is operated by the Teck Corporation, and Cambior is responsible for the marketing of the ferroniobium. During the year expenditure was incurred in shaft deepening and the development of underground infrastructure in a new block which will enter into production in the third quarter of 1999. Production in the current year is expected to reach levels similar to those of 1998. Proven and probable reserves are listed as 5.3 million tonnes at 0.73% Nb₂O₅.

Sons of Gwalia

The company has announced that tantalum production from the Wodgina and Greenbushes mines for the first quarter of 1999 was 226 515lb, with sales of 217 523lb. Construction of the expanded processing facilities at the Wodgina mine was well advanced, and commissioning would occur in July 1999, thus increasing production levels from 180 000lb to 300 000lb of tantalite per year, added Sons of Gwalia.

Kemet

For the quarter ended March 31st 1999, the company reported sales of \$143.5 million. These results 'showed improvement in revenues and earnings over previous quarters, as we continue to see signs of a recovery in our industry', stated Mr David E. Maguire, Chairman, Chief Executive Officer and President. He added that bookings for March and April were considerably stronger than in previous months, and the increase in demand had served to counter the decline in average selling prices which had been seen over the preceding eighteen months. The improvement in demand and in selling prices was expected to continue.

Although the value of sales of both surface-mount and leaded capacitors were less than for the corresponding quarter last year, unit volume increased 13%.

Alfred H. Knight

Alfred H. Knight International Ltd. has announced an expansion in the form of two new projects, undertaken to extend the provision of its independent services further afield.

The former ZCCM laboratory in the Zambian copper belt has been acquired and renamed AHK Zambia. It will offer assaying on a range of materials as well as mineralogical and metallurgical investigation services.

The company has also established AHK Australia with a sampling and preparation facility at the port of Townsville in Queensland, which will act as an initial base for the provision of services throughout Australia.

Ningxia Non-ferrous Metals Smelter

Ningxia Non-ferrous Metals has restructured its organisation, and sponsored a limited company on April 24th 1999, Ningxia Orient Tantalum Industry Company Limited. The public company has been formed to market tantalum, niobium and beryllium. NNMS holds 96% of the shares of the company, and its Director Mr He Ji Lin will be CEO and Chairman of the Board of the new enterprise.

CBMM and Brazil 2000

CBMM (parent company of Reference Metals) staff members are associate leaders of a field trip to Araxá, one tour among the many

offered in the extensive programme of the 31st International Geological Congress. General Symposia, Special Symposia and Colloquia, workshops and short courses are also planned alongside debates and keynote addresses.

The Congress will take place in Rio de Janeiro from August 6th to 17th 2000 and abstracts for papers in the Symposia are invited by September 1st 1999. There is a website at www.31igc.org, says the announcement.

Showa Cabot Supermetals

Mr Yasuto Komatsu has retired as President of Showa Cabot Supermetals but will maintain his connection with the firm as an adviser.

Mr Minoru Yamanaka succeeds Mr Komatsu as President, and also becomes the nominated delegate of the company to the T.I.C. Mr Yamanaka has been with Showa Denko for more than thirty years, he joins Showa Cabot Supermetals from the Electronic Materials Division at Head Office.

Solikamsk Magnesium Works

From Metal Bulletin of April 29th 1999, we learned that Mr Andrei Gorshkov, who has often attended T.I.C. assemblies, has been appointed Marketing Director at Solikamsk. He succeeds Mr Pavel Detkov, who has risen to Managing Director, in place of Mr Anatoly Schelkonogov, while Mr Schelkonogov has become Chairman of the Board of Directors and Director of Investments.

H.C. Starck

The web page of H.C. Starck confirms that tantalum and niobium are used in up-to-the-minute technology applied to modern everyday life.

To avoid 'blind spots' for mobile phones where reception is poor or non-existent, a special iridium satellite phone has been developed to use a flawless network of transmitters provided by satellites. This special phone uses lithium tantalate and niobate for the surface acoustic wave filter in the antenna, reports Starck.

Many new cars now have air cushions or bags which inflate in an accident, to protect the passengers, and Starck describes an application of tantalum in this context. In the electronic crash sensor designed to recognise a collision situation, tantalum capacitors trigger an electric impulse that ignites a powder, a mixture of potassium nitrate and amorphous boron. The energy released by the reaction decomposes the sodium azide pellets around the fuse into nitrogen and sodium. The sodium bonds with molybdenum disulfide (Molyform®), the nitrogen gas causes the airbag to inflate, and all this takes place 'in a matter of 40 milliseconds'.

H.C. Starck, Inc. at PM²TEC'99

H.C. Starck, Inc. will take part in the exhibition of PM²TEC'99 in Vancouver from June 20th to 24th, the International Conference on Powder Metallurgy & Particulate Materials, run by Metal Powder Industries Federation and APMI International.

A paper on the 'Effect of process parameters on CIP/sinter densification of tantalum powder' will be presented by John Bingert and Sherri R. Bingert of Los Alamos National Laboratory in session 41 of the conference. Korean researchers from Gyeongsang and Chonnam National Universities will present 'Mechanical behavior and microstructure of Al-Nb alloy fabricated by mechanically alloyed powders' in session 44. Complete abstracts and information on the conference are to be found on the website www.mpif.org

Alex Stewart (Assayers)

Ms Sarah-Jane Howitt, marketing manager, will give a presentation on 'An overview of scrap assaying and sampling' at the Metal Bulletin Non-Ferrous Scrap Markets Seminar on June 9th 1999.