

T.I.C. Activities

The Ninth General Assembly of the T.I.C. was held in Rothenburg ob der Tauber, West Germany, on 10 May 1978. The principal business of the meeting was the election of the Executive Committee for 1978-1979 and the acceptance of four new members of the T.I.C.

The Executive Committee will be :

Mr. Reinhard Deil - President
Mr. Paul Leynen
Mr. Herman Becker-Fluegel

One additional Executive Committee member will be elected at the Tenth General Assembly in October 1978.

The new members of the T.I.C. are :

Brandeis, Goldschmidt & Co. Ltd., England
NRC Inc., U.S.A.
Showa-KBI Co., Ltd., Japan
Thermo Electron Co., Inc., U.S.A.

The addition of these members, less one who resigned, brings the total membership of the T.I.C. to thirty-two.

First International Symposium on Tantalum

The First International Symposium on Tantalum was held from May 10 through May 12 in Rothenburg ob der Tauber and Nuremberg, West Germany. The Symposium was attended by almost 150 delegates representing mining companies, tantalum processors and recyclers, tantalum product producers, and commodity traders, plus representatives of consulting companies, publications, universities and government agencies interested in the supply and use of tantalum. The delegates attended from eighteen countries spread over all six continents.

The physical aspects of the Symposium, arranged and handled by the personnel of Gesellschaft für Elektrometallurgie mbH., were superb. Delegates were met at the Nuremberg Airport upon arrival and transported by private bus directly to their hotels in Rothenburg, a pleasant one and one-half hour drive through the beautiful countryside of Northern Bavaria. Due to the limit in size of the hotels in picturesque Rothenburg, the delegates were accommodated in several fine hotels. The headquarters of the T.I.C. and delegate registration took place at the Hotel Eisenhut located a few steps away from the Market Square in the center of the town. At the close of the second day of prepared papers, all delegates were transported, again by private bus, back to Nuremberg for two nights at the Hotels Grand and Carlton in order to participate in the festivities and plant visits planned in that city.

The Programme of the Symposium consisted of four parts : formal presentation of papers, plant visits, social events, and a ladies' programme for the wives who accompanied many delegates.

PRESENTATION OF PAPERS

The meeting hall in the Reichstadthalle in Rothenburg was used for the four sessions in which the eleven formal papers were presented. Although the building is centuries old, the accommodation and arrangements for the delegates were most modern and comfortable.

A very brief summary of each paper follows :

— "Metallurgy, Production and Applications of Tantalum" by Professor Dr. R. Kieffer, University of Vienna.

The paper discussed the history of tantalum, some geochemical considerations, modern and old processes for the separation of niobium from tantalum, production of the metal, and refining processes. A variety of applications of tantalum were also covered.

— "Outlook for Tantalum : Is the Balance Favorable ?" by T.C. Barron, Emory Ayers Associates, Inc., U.S.A.

The long term balance of world demand and supply for tantalum was analysed and determined to be affected by the complex trends in key demand areas compared to existing tantalum sources limited in their ability to increase output. Some new sources have been identified, but there are barriers to their rapid exploitation.

T.I.C. NINTH GENERAL ASSEMBLY

On 10 May 1978, the Ninth General Assembly of the T.I.C. convened at the Hotel Eisenhut in Rothenburg ob der Tauber, West Germany. Thirty-six participants represented twenty-seven of the twenty-nine members.

Since the General Assembly was followed by the First International Symposium on Tantalum, the meeting conducted only the business of the organization.

The membership re-elected the same three members to the Executive Committee for the coming year and agreed that one further member should be elected at the Tenth General Assembly, thus filling four of the five places permitted by the statutes of the association. Mr Reinhard Deil, Geschäftsführer of Gesellschaft für Elektrometallurgie mbH in Düsseldorf, was elected President of the T.I.C. for the year 1978-1979, to assume office at the close of the Symposium.

One member, Tennant Trading Ltd., submitted their resignation from the T.I.C. and it was accepted. Four newly-elected members, however, bring the current roster to thirty-two members.

Greenbushes Tin N.L. extended an invitation to have the Eleventh General Assembly in Perth, Western Australia, followed by a mine visit to the Greenbushes operation 250 km south of Perth. The meeting welcomed the invitation and it agreed tentatively to hold the Assembly in Perth in early May 1979, subject to further discussion and confirmation at the Tenth General Assembly.

The Tenth General Assembly will be held in Brussels, Belgium, on Friday 13 October 1978.

— "The Interplay of Industry and Trade Press with Special Reference to the Problems of Representative Price and Market Information" by T.J. Tarring, Metal Bulletin, London (presented by John Parry, Joint Editor of the "Metal Bulletin", in the absence of Mr. Tarring).

The practice of using published prices, producers' prices and futures market prices to index transactions is longstanding. If an index is a price published by a trade newspaper, however, it is worrisome to the trade. The problems were defined and the practical aspects discussed.

— "The Relationship Between the Cost of Tantalum and Tantalum Capacitor Demand" by R.W. Franklin, ITT Components Group Europe, U.K.

As tantalum capacitors are more expensive than other types, their main selling feature must be superior performance which is being attacked through improvements in aluminium capacitors. In the delicate balance between cost and performance, any increase in material costs will reduce demand. Stability has been achieved through the use of increased automation and higher CV tantalum powders. Capacitor manufacturers seek stability in material cost and adequate supplies of tantalum to avoid a scramble for material.

— "An Impact Study and Alternative to the Usage of Solid Electrolyte Capacitors Due to the Current Trends in Ta_2O_5 Pricing and Supply" by W.E. McLean, Sprague Electric Company, U.S.A.

There is a need for a more stable market for tantalum ore, the price of which is compared to other dielectric systems. There are areas where other lower priced systems may be substituted for tantalum if price and availability become prime considerations with a future reduction of tantalum powder requirements. Reduced titanates in ceramic dielectric systems have begun to replace tantalum in low to medium CV applications. Continued escalation of tantalum powder prices has led to worldwide research on dielectric systems utilizing niobium, doped niobium and solid aluminium.

— "Role of Tantalum Powder in Capacitor Use" by J.A. Cenerazzo, Kawecki Berylco Industries, Inc., U.S.A.

The historic demand for capacitor grade powder relative to the increased production of capacitors shows the increase in demand is less than the capacitor increase because of higher capacitance powders. This is the direct way to extend the available tantalum supply.

— "Use of Tantalum Carbide in Cemented Carbides" by S. Ekemar, Sandvik AB, Sweden.

Tantalum carbide plays an important role as an alloying constituent in cemented carbides, mainly those for metal cutting. Further, there are new trends as regards coated carbides for inserts. There is a possible effect of modern titanium carbide-nickel grades on the use of cobalt-base cemented carbides, coated as well as uncoated. Considerable effort is being expended to replace tantalum carbide with other hard constituents.

— "Tantalum Developments in Europe - Products and Processes" by G.J. Korinek, Hermann C. Starck Berlin, Germany.

Because of different technology and economics in the U.S.A. and Europe, tantalum products and processes developed on each continent in unique and separate ways. In the area of raw material, Europe has developed a unique process for the treatment of low grade slags, a process of great importance in extending raw material supply.

— "Specific Problems Related to Tantalum Production" by H. Heinrich, Gesellschaft für Elektrometallurgie, Germany.

A way to lower increasing costs arising from the need of working lower grade tantalum materials is to recover other metals which occur together with tantalum. Based on possible proceedings in the chemical plant, other means of reducing processing costs can be found.

— "Engineering Aspects of Tantalum Chemical Equipment" by G.D. Corey, Fansteel Inc., U.S.A.

The main focus of the engineer is arriving at optimum proportions for any given piece of equipment based on thermo-chemical requirements and structural mechanics which define the period of useful life in any given application.

— "Tantalum in Chemical Process Engineering Plants" by F. Sperner and C.H. Liesner, W.C. Heraeus GmbH., Germany.

The corrosion, mechanical and physical properties of tantalum as well as the method of manufacture of the tantalum products used all influence the building of tantalum apparatus in self-supporting construction, loose linings, and explosion-plated designs.

The presentations were summarized by G.B. Brown, Technical Adviser to the T.I.C., by offering the possibility that, through the information interchange function of the T.I.C., members could be able to provide each other with knowledge as to the means each is taking to offset the expected shortfall of supply so that others can use similar methods to attain the common goal of the industry to provide adequate material to meet the needs of the market.

PLANT VISITS

A complete tour of the GFE plant in Nuremberg was provided on the final morning of the Symposium followed by the official closing by the President of the T.I.C., Mr. Paul Leynen, during a lunch served to delegates by GFE in the company canteen. The afternoon was spent by the delegates visiting the Grundig-Works, the largest European producer of colour television sets.

SOCIAL EVENTS

The social events of the Symposium provided excellent opportunity each day for relaxation and conversation after the intensive technical programmes. On Wednesday evening the Lord Mayor of Rothenburg received delegates and their wives in the Town Hall, and on this occasion a gift of an engraved pewter tray was presented to the City of Rothenburg to mark the Symposium. After the reception a festive dinner was served in the Reichshofhalle. The guest speaker at the dinner was Mr. Franz Sackmann, Staatssekretär in the Ministry of Economics and Transport of the state of Bavaria, who gave the guests a general view of the history of Bavaria, its economic status and its position as a part of Germany.

On Thursday evening a gala reception was held in the Kaisersaal, the grand hall of Nuremberg Castle located high on a commanding hill overlooking the city of Nuremberg. An excellent buffet featuring the local dishes of Bavaria accompanied by local wines was served, after which the guest speaker, Kammerpräsident Konsul Senator Walter Braun, gave an interesting account of the history and industry of Nuremberg. Mr. Leynen presented to the City of Nuremberg, on behalf of the T.I.C., an engraving of Brussels as it was in 1704, in recognition of the similarity of the development of Nuremberg and Brussels, headquarters of the T.I.C.

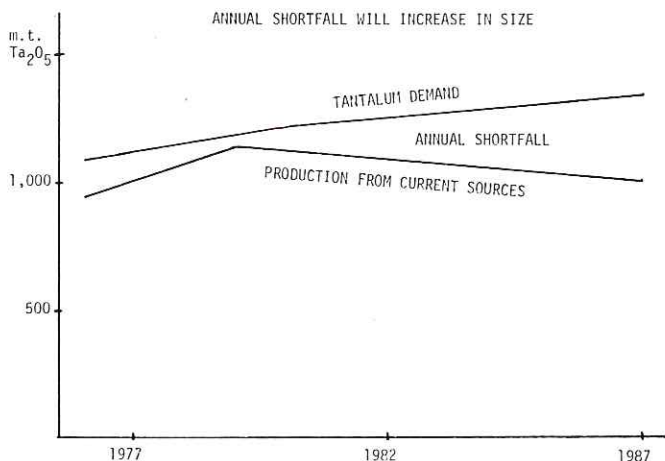
World Tantalum Supply and Demand : Is the Balance Favorable ?

This article is a condensation of a presentation made at the First International Symposium on Tantalum on May 10, 1978 by Mr. Tom Barron, Emory Ayers Associates.

Is the supply/demand balance favorable? The answer is "no", but the outlook is only disastrous if the industry fails to respond quickly and innovatively.

Over the next ten years

- World production of tantalum-bearing concentrates and slags from current sources will never be sufficient to meet world requirements for materials. Today the shortfall is about 100 m.t. and this may grow to almost 700 m.t. annually by 1987.



- Inventories will make up the shortfall for the next ten years after which the inventories will be exhausted.
- Tantalum projects now in planning stages can yield only enough new material to postpone the exhaustion of inventories by another 2-3 years.
- Major new tantalum sources must be found and developed. There is time to do so if the industry responds rapidly and innovatively.

WORLD DEMAND

The world need for tantalum materials is increasing at about 2.5 % annually between 1978 and 1987. The low rate is the net result of a number of trends working to depress the demand for tantalum materials, even though demand for final products (capacitors and cemented carbides) continues to grow. The two principal determinants of world tantalum demand are the cemented carbide and capacitor markets.

Capacitors

The market demand for tantalum capacitors will grow dramatically in the 1978-1987 period. The forecast is that about 2.6 billion units will be shipped in 1982. Despite high unit growth, tantalum needs for capacitors will grow at an average of only 2.1 % annually because of three fundamental trends:

- The average CV-rating of capacitor powders consumed is increasing more rapidly than was anticipated. In the U.S. the average rating is probably about 5,000 to 5,500 today. The trend will continue toward the 7,000-7,500 level by the early 1980's. In Europe and Japan the average CV-rating is already higher and will continue to climb.
- The fastest growing segments of the capacitor market are those where the tantalum content is the least - automotive and entertainment.
- Substitution of aluminium and ceramic capacitors for tantalum will continue to reduce tantalum's share of the capacitor market. The substitution is largely price based as tantalum capacitor material costs have risen faster than those for aluminium and ceramics.

Carbides

Tantalum usage by the cemented carbide producers will increase at a faster rate than in the capacitor market. The economic outlook for the metalworking industry and for cemented carbides is good, but there are trends working to reduce tantalum usage in the long term. Tantalum growth is higher in cemented carbides because it takes longer for the full effect of negative trends to be felt due to the metalworking industry fragmentation and complexity. There is not an industry structure which enables rapid changes in usage even if universally desired.

There are several positive trends which favor more tantalum consumption by cemented carbide producers:

- Continued penetration of the tool steel share of the metalworking market.
- Rapid rises in the prices of tungsten and cobalt which soften consumers' sensitivity to tantalum price increases.

- Columbian price increase tending to discourage substitution of columbium for tantalum.

On the negative side, there are trends working to reduce the tantalum content in cutting tools and wear parts:

- Titanium carbide and ceramic inserts are both taking market share away from tantalum-containing tungsten carbides.
- Coated carbides are making inroads into the sales of other cemented carbides.

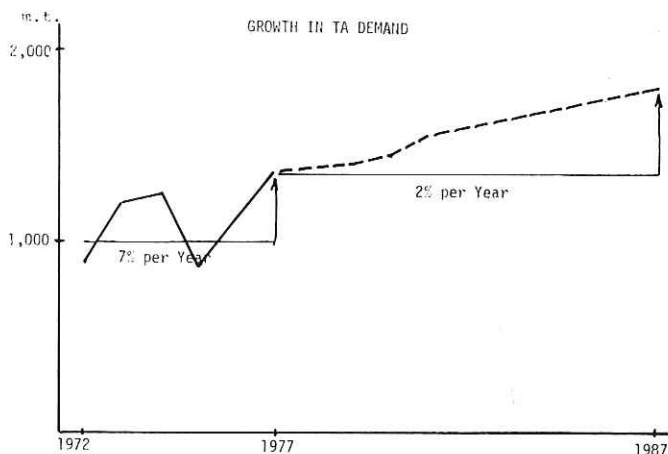
The cemented carbide industry need for "virgin" tantalum is also being reduced by secondary supplies:

- Intensive efforts are being made to increase scrap-insert recycling and to improve the recovery of tantalum.
- Increased usage of capacitor, mill product, and other miscellaneous scrap as feed-stock for tantalum carbide production.

From this very complicated set of trends and counter-trends, 3.4 % annual growth in the tantalum needs of the carbide producers is forecast for the next ten years.

Total Tantalum Demand

Adding in the demand from the mill product and additive alloy markets, world tantalum requirements will rise from about 1300 m.t. in 1977 to 1435 m.t. in 1980 and to 1676 m.t. in 1987. This is an average growth rate of only 2.6 % per year.



WORLD SUPPLY

The world supply outlook is divided into two parts: production from existing sources and inventory supplies. World tantalum production does not now, and will not in the future, meet demand. The shortfall will be made up from inventories in the hands of processors.

Production at Current Sources

From all current sources, tantalum output will be about 1290-1300 m.t. in 1978 and 1979. Then output will decline steadily despite higher prices. The decline, between 1980 and 1987, will occur because:

- Tanco's Bernic Lake deposit will be exhausted by 1982-1983.
- Thailand's tin production is unlikely to rise despite a world-wide tin shortage.
- Present reserves in Australia, Brazil and Zaire will be substantially depleted. Nigerian tin/columbite reserves will be reduced unless exploitation of the sub-basalt deposits is successful.

Inventories

Fortunately for the tantalum supply/demand balance, several processors have large inventories of tin slags or other materials which can make up the shortfall. There are about 3300 m.t. Ta₂O₅ available in 1977 from inventories. To this the inventory of about 1840 m.t. of low-grade (less than 2 %) tin slag can be added. At higher prices and with newly developed technologies, these slags will be useable.

But without new sources of production, these inventories will be exhausted sometime in the 1988-1989 period and, once gone, will not be replaced. The U.S. National Stockpile has almost 1240 m.t. of Ta₂O₅, but this will probably never be sold.

Price

The price of 30 %-base Tantalite could easily rise from its present \$25-\$26 level to about \$34-\$36 in 1980 and perhaps to \$45-\$48 by 1982-1983. The price pattern should be gradual and steady. It is unlikely that there will be wide fluctuations as there have been in the past. Producers can look forward to a decade of price consistency which will favor long-term capital investments in mining operations.

WHAT CAN BE DONE ?

Find new sources. The tantalum industry's opportunities to produce from new sources are divided into two categories :

- Planned projects - There are a few modest sources which could add about 172 m.t. per year to world supplies by 1981 and would prolong the life of the processor inventories about two years. The projects are greatly needed and it is to be hoped that present producers can bring them to fruition as scheduled.

- Areas of high potential with little or no infrastructure - Primarily those where tantalum has already been found in quantity.

- Canada's Bernic Lake area has the necessary infrastructure and the right geological formations, but no new deposits have been identified.

- Mozambique possesses great potential, but has never been carefully explored. Tantalum reserves could be large and infrastructure would not be difficult to provide.

- Brazil has several areas of high potential. The Northeast has in the past produced substantial quantities of tantalite, but now yields little.

- Egypt possesses huge, but low-grade, tantalite reserves (8000 - 13000 m.t.) in the Eastern Desert. Almost all infrastructure is lacking. Lack of water is the biggest problem.

- Zaire has large identified pegmatite bodies, but no single tantalum concentration of importance.

The barriers in these areas are great and successful finds and new production are a real possibility. If several new major sources are developed from these areas it is possible that much of the annual shortfall can be eliminated by 1987.

There is an outside factor which may provide supporting incentive to propel development in these and other pegmatite areas, the concurrent strength in world demand for the co-products often found with tantalum : lithium, columbium, and tungsten. Research on the end-use markets indicates buoyant demand over the next decade.

Who should do what in these countries ? Some useful generalizations can be made :

1. For miners/smelters/trading companies and even processors :
— Companies operating in the less developed countries should "educate" the governments to the tantalum situation.

- Tantalum companies should look at consortia arrangements to develop major mining opportunities to spread risk and increase financing capability.

- Review opportunities to obtain additional supplies from scrap and from residues containing tantalum.

2. Tantalum Information Center (T.I.C.)

- Provide statistics so the supply/demand balance is current.

- Sponsor or encourage efforts to catalogue new sources.

- Keep information on tantalum flowing and reduce compartmentalization of the industry between miners and traders, between traders and processors.

- Represent the industry and its situation with interested governments.

In summary, the production/demand balance is unfavorable, but there are inventories which will last 8-11 years. During this period, consumers can expect to get the tantalum which they need. This is enough time for the industry to respond and close the gap if it acts quickly. The industry must find several new major sources over the next several years and this will require innovative approaches.

Tin slag and concentrate production by T. I. C. members

The members of T.I.C. report their production of tin slags and concentrates containing tantalum on a quarterly basis. The data accumulated for 1975 through 1977 is as follows :

Tantalum Production (lb. Ta₂O₅ Contained)

	Slags	Concentrates	Total
1975			
1st quar.	263,300	175,466	438,766
2nd quar.	183,491	165,809	349,300
3rd quar.	205,696	164,863	370,559
4th quar.	226,765	185,047	411,812
Total	879,252	691,185	1,570,437
1976			
1st quar.	198,572	199,359	397,931
2nd quar.	204,494	102,670	307,164
3rd quar.	236,047	199,447	435,494
4th quar.	266,620	200,146	466,766
Total	905,733	701,622	1,607,355
1977			
1st quar.	290,424	209,795	500,219
2nd quar.	308,344	232,263	540,607
3rd quar.	222,734	151,854	374,588
4th quar.	181,744	161,974	343,718
Total	1,003,246	755,886	1,759,132

The data has been obtained from thirteen mining company members of the T.I.C. except in the last two quarters of 1977 for which one smaller producer has not yet reported.

The consistent increase in both slag and concentrate production probably reflects the surge in world tin demand and the stimulation of tantalite production by higher prices. The growth in total

output is about 7 % annually, but the proportion in slag has increased slightly from 56 % in 1975 to 57 % in 1977.

The reported production appears to represent about 75 % of the free-world production of slags and concentrates (reference : Emory Ayers Associates, Inc. and the U.S. Bureau of Mines). Best estimates indicate that the total production in 1977 of concentrates and tin slags over 2.5 % was about 2.4 million lb. of contained tantalum oxide. Using current estimates that world demand is in the range of 2.8 to 3.0 million lb. contained oxide, a shortfall in supply ranges from 0.4 to 0.6 million lb. The T. I. C. member producers are supplying about 60 to 65 % of the world's needs.

T.I.C. MEMBERSHIP

During the Ninth General Assembly on 10 May 1978 the following companies were elected to membership of the T.I.C.

Brandeis, Goldschmidt & Co. Ltd.,
4 Fore Street
London EC2P 2NU, England.

NRC Inc.,
45 Industrial Place,
Newton,
Massachusetts 02164, U.S.A.

Showa-KBI Co., Ltd.,
Shiba Toho Bldg., 2F.,
1-7-24, Shiba-Koen Minato-ku,
Tokyo, Japan.

Thermo Electron Co., Inc.,
9 Crane Court,
Woburn,
Massachusetts 01801, U.S.A.