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T.I.C.

TANTALUM-NIOBIUM INTERNATIONAL STUDY CENTER

PRESIDENT'S LETTER

The tantalum industry is alive and well with demand strong in all sectors, except maybe carbides. The U.S. government agency DLA continues to offer tantalum to the market in the form of oxide, carbide and concentrate. Because of the strong demand levels industry has no trouble in absorbing the quantities being offered. With strong demand come firming prices and these lead to increased activity at all levels of the supply chain. A number of new operations have commenced in Africa and discoveries are being made in Canada and elsewhere.

So far these are all relatively small production capabilities and the industry needs to continue to discover and develop hardrock mines as Sons of Gwalia is doing in order to keep up with the growth in demand. Some of the papers to be presented at the meeting in October will address this issue in significantly more detail.

The industry is also looking at itself critically in a number of areas to address the issue of decreasing margins and increasing capital expenditure requirements.

The T.I.C. will initiate a renewed drive to encourage the end users in the electronics industry to become active members of our organisation. It is through discussion and understanding between all aspects of the industry that stability can be maintained and a steady growth achieved for the industry as a whole. Perhaps the panel discussion at the October meeting will address some of these issues and allow for some discussion by members.

Hope to see you all in Perth in October.

John Linden
President

SYMPOSIUM IN 2000

Call for papers

As you know, the T.I.C. is organising another International Symposium on Tantalum and Niobium.The Grand Hyatt, San Francisco is the place, October 22nd to 25th 2000 is the time. Similar events in Rothenburg-ob-der-Tauber, Orlando and Goslar went very well, now we are asking for your contribution to the success of the next Symposium.

Please send us your proposals for papers to be presented

- the title and subject
- the author
- an abstract of 3-4 lines
- send before October 15th 1999

(the draft programme will be discussed when the Committee meets in Perth).

An outline for discussion is given below, but all suggestions are welcome, other topics of interest to the industry will gladly be considered. A paper may cover niobium or tantalum or both.

Raw materials: Mining/production, technological innovations, supply
Processing: Powders, new developments, limits of current technology
Users: Tantalum capacitors, processes, new development/optimisation
Metallurgical products - new processes and applications
End users: Market demand, future outlook

PERTH, OCTOBER 1999

Fortieth General Assembly and Associated Meeting

The available abstracts for the presentations in the technical programme are shown below.

ABSTRACTS

Future production options: Greenbushes and Wodgina tantalum mines
by Mr David Bale, General Manager – Minerals Division, Sons of Gwalia Ltd

Greenbushes Mine

The Greenbushes tantalum resource contains over 75 million lb of Ta_2O_5 in situ. Production for the financial year ended June 30th 1999 was 730 000lb. Future production can be maintained at greater than 600 000lb per annum, despite falling open cut ore grades, but only by investing capital to increase plant processing capacity and efficiency. Studies of the feasibility of accessing higher grade ore by underground mining and further extensions of the open cut mine are also under way.

Wodgina Mine

The Wodgina tantalum resource contains over 30 million lb of Ta_2O_5 in situ. Production for the financial year ended June 30th 1999 was 180 000lb. A capital investment of approximately AUD20 million to extend the scale of this open cut mining operation was completed in July 1999. The installed production capacity of the mine is now nominally 350 000 to 450 000lb Ta_2O_5 per annum. Longer term production levels are dependent on sustaining current ore grades. The geological region is highly prospective, and options to expand the operation further are being investigated.

A decision as to the optimum medium to long term operating scale for both sites will be dictated by the market.

Production of niobium and tantalum from the Pitinga hard rock tin mine
by Mr Jorge Jose Correia Salles, Marketing and Strategic Planning Manager, Paranapanema

After a brief overview of the Paranapanema Group, a summary of the Tin Division operations will be presented, underlining the mining activities in Pitinga, located in the Brazilian Northern region. Some technical aspects of the Hard Rock Project will be discussed, along with the recent development of Paranapanema regarding its entrance in the tantalum/niobium industry.

Niobium today: Aerospace and superconductor applications
by Mr Barry P. Valder, Business Development, Niobium/Superconductivity, Oremet-Wah Chang

While there exist many different and varied applications for niobium/niobium alloy metal today, this presentation will focus on two specific areas - our WC-103 alloy for aerospace applications, and Nb47Ti for those applications pertaining to High Energy Physics (HEP) programs.

In 1956, construction of a facility to manufacture production volumes of zirconium and hafnium products began in Albany, Oregon, to provide the necessary materials to help power the U.S. Naval Nuclear Propulsion System. In the early sixties, in an effort to diversify markets and to expand, Wah Chang installed new facilities to manufacture niobium/niobium alloy – or in those days columbium metal. The key markets identified were aerospace and superconductors.

There was tremendous research performed at this time to develop 'space age' materials to support various NASA programs. One of the most successful alloys coming out of this research was the Wah Chang alloy WC-103, which contains about 10 w/o hafnium and 1 w/o titanium. The key to the success of this material is directly related to its fabricability, and its ability to withstand high-stress levels at elevated temperatures. WC-103 became the alloy of choice for many of the aerospace applications – rocket thrusters, nozzle skirting, and jet engine thrust augmentors.

During this same period of time research performed at Bell Laboratories predicted a future for niobium materials in the world of superconductivity. Wah Chang invested heavily into research that has allowed us to become one of the leading producers of niobium metal and NbTi alloy today for superconducting applications. Expansion began in earnest during the mid-eighties in a new facility to manufacture product to feed the Superconducting Supercollider. Today that effort has allowed us to become the leading supplier of NbTi alloy for the Large Hadron Collider being built at CERN in Switzerland. Oremet-Wah Chang stands poised to build on this success as work continues on various other HEP programs around the world.

Tantalum-containing tin slag supply from South East Asia
by Mr Yeap Soon Sit, Managing Director, SA Minerals

In the light of the recent upsurge in shipments of tantalum-containing tin slag from South East Asia, this paper will attempt to re-examine the important role of tin slag from South East Asia in the tantalum raw material supply picture from 1995 to 2000 and give a reasonable projection to its future as a viable tantalum source material.

Commercial application of niobium in thin films
by Mr Tadeu Carneiro and Dr Harry Stuart, Reference Metals

Niobium has recently developed into an important material for thin film applications. Niobium's optical and electronic properties are being commercially exploited in several fields via deposition of a thin film of this material to confer specific properties. Although not currently representing a large demand for the metal, these applications have good potential for future increase in the demand for niobium.

In architectural glasses niobium thin films can be applied to filter undesirable radiation to help control the gain or loss of heat in buildings. In flat panels niobium thin films can be used to improve the antireflecting (anti-glare) properties of the surface. In addition, niobium thin films are being applied in razor blades to ensure that diamond-like carbon films are properly adhered to the stainless steel substrate.

New development in powder technology
by Mr Tomoo Izumi, Managing Director R/D, Showa Cabot Supermetals KK

Tantalum capacitors are used for many electronic devices and the consumption of personal computers and cellular phones is increasing very rapidly. For these applications, the capacitance of tantalum chips is becoming large compared with the conventional type and CV levels of tantalum powders are also becoming higher. We, at Showa Cabot Supermetals, are developing these high CV powders and supplying them to customers world-wide. In this paper, the qualities of these high CV powders and the problems caused by finer tantalum particles are discussed.

Production of superalloys in Western Australia
by Mr Graham Durber, Operations Manager, Western Australian Specialty Alloys

WASA began its VIM and VAR superalloy operations in 1994 and quickly gained approval for a range of remelt barstock alloys for aerospace castings. These included equi-axed, directionally solidified and single crystal alloys for turbine blades and nozzle guide vanes and alloy for powder turbine discs.

Simultaneously, melt profiles were developed for VIM+VAR aerospace rotor quality IN718 and Waspaloy ingot. Over 200 rotating components (turbine and compressor discs and shafts) have been delivered and are flying in various civil aircraft engines.

WASA is now at the forefront of melting technology with the development through 1996-1998 of triple-melt (VIM+ESR+VAR) IN718 ingot. The addition of the ESR stage provides an improvement over VIM+VAR in the microscopic cleanness of ingot. This can be assessed in UST testing through a significant reduction in incipient defects.

WASA has developed worldwide sales and now holds an important and strategic position in Australia for the production of superalloys.

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

The mobile phone industry is still very young and its influence on our lives will continue to grow. Any business that continually gives better performance at a lower cost year after year must be attractive to the end user. The lifecycle for these products is getting shorter, not because they are less reliable than earlier products but because they are outdated by changes to technology. Each generation has more features and functions than the previous one, placing more demands upon designers and components suppliers. Only by meeting these demands and creating new products can component suppliers continue to contribute to long term growth.■

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GLOBAL INITIATIVE ON HIGH PRODUCTION VOLUME CHEMICALS

In line with the world-wide 'Responsible Care' programme and the commitment to safe management of chemicals throughout their entire life cycle, the International Council of Chemical Associations (ICCA) launched an initiative in October 1998 to improve ecological and toxicological data on high production volume (HPV) chemicals. Although this is a voluntary initiative, it also recognizes the national, regional and international legal obligations on high tonnage chemical substances, including regulations in the United States, the European Union and Japan. The aim is to collect basic information (i.e. physical, chemical, toxicity and ecotoxicity data) comparable to the Screening Information Data Sets (SIDS) of the OECD programme.

At the meeting of the Executive Committee in April 1999 it was noted that, for example, toxicological data on tantalum and niobium metal powders, their oxide compounds and potassium heptafluorotantalate (K_2TaF_7) are far from complete. It was, therefore, suggested that the T.I.C. should compile these data along lines similar to the studies conducted by the International Tungsten Industry Association and the International Molybdenum Association. These generic data would then be made available to all member companies.

The cost for investigating each substance is estimated at 100 000 DM. As in the case of the other industry associations, it was proposed that funding be shared by all processing companies. Interested delegates are asked to contact Dr Axel Hoppe of H.C. Starck GmbH & Co. KG, who will chair a sub-committee to co-ordinate the proposed evaluation on behalf of T.I.C.

In anticipation of the possibility of even more stringent regulations for chemical substances, the ICCA has designated 2004 as the deadline for compiling data sets on approximately 1000 HPV chemicals in a list it has established. Although tantalum and niobium compounds are not included in this list, it would be an important psychological advantage to have the data available before such information becomes mandatory or restrictions are imposed by authorities, especially since one need not anticipate the discovery of any hazards.

IBM TANTALUM CAPACITOR USAGE

Presented by Mme Sylviane Bordas, Electronic Components Procurement Manager IBM, at the T.I.C. meeting in Prague, October 1998

IBM E-BUSINESS DIRECTION

Information technology combined with web applications constitutes e-business: it allows enterprise computing and gives the power of Internet, and its aim is to provide competitiveness for your customer and for you.

IBM e-business offers IBM expertise in web site development, in intranet and internet, and in commerce. It allows extensive exchange with customers and suppliers as well as business partners. e-business will also help to find and reach new opportunities and new customers, by connecting people. It will allow business, government and educational institutions to reach new markets, offer new services and lower their costs.

The forecast for Internet usage between 1998 and 2002 is for global growth of more than 220%: by 2002, more than 470 million people are expected to use the Internet.

	Users in 1998 (millions)	Users in 2002 (millions)	Growth
U.S.	75.9	221.9	+192%
Western Europe	36.6	110.1	+201%
Japan	13.8	37.0	+168%
Rest of Asia	9.8	50.1	+411%
Rest of world	12.0	58.5	+338%
Total	**148.1**	**477.6**	**222%**

Table 1: Internet growth is global

It took 38 years for the radio to reach 50 million users, 13 years for TV and 10 years for cable to reach that number. It took only 5 years for Internet to reach the same number of users – the fastest adoption curve in history. An explosion in e-commerce is expected to follow, increasing between now and 2002 to reach $300 billion.

Returning to the nature of e-business, it is an organisation that connects critical systems directly to their critical constituencies, such as customers, employees, vendors and suppliers, using intranets and extranets, and over the Web. e-business is IBM's strategic direction. Mr L.V. Gerstner, IBM Chief Executive Officer, said in February 1998 'e-business moves the agenda of the IT industry back into the CEO's office. It is a fundamental change in the way business is done'.

So we could say that e-business will drive requirements in hardware, software and services. Within hardware, it will drive the needs of PCs, servers and control units, and therefore requirements for tantalum.

IBM CAPACITOR REQUIREMENTS

IBM has a global presence and has manufacturing facilities for cards in various geographical areas. In Europe, the main plants producing electronic cards are located in Vimercate, Italy, and in Greenock, Scotland. For the USA there is the Rochester plant, and in Japan our chief plant is in Yasu.

Procurement is a global function within IBM. Each main family of products or services is managed through a Procurement Council, in which the various IBM divisions and geographical areas are represented, the speaker represents Europe within one of these organisations.

Capacitors belong to the AOP Council – Active, Optic and Passive components. These components represent 3000 references and have a projection of 20 billion pieces purchased in 1998. The Council is responsible for developing global commodity strategies, and for global contracts; it checks the qualifications of supplier and component, provides sourcing and technical direction, and it manages the supplier relationship, with the goal of providing the best procurement solutions for IBM.

TANTALUM CAPACITORS

Moving to the usage of tantalum capacitors by IBM, Figure 1 shows a comparison of the purchases of different kinds of capacitors, in terms of volume and also in dollars, for 1998. Ceramics account for the majority of the capacitors consumed globally, 90% of the volume but 48% of the total dollars spent. Tantalum capacitors account for only 8% of the volume, but for 42% of the dollars spent on capacitors. In the last few years

tantalum capacitors have increased their share, and so have ceramic capacitors, to the detriment of film capacitors. Aluminium capacitors' share has remained stable.

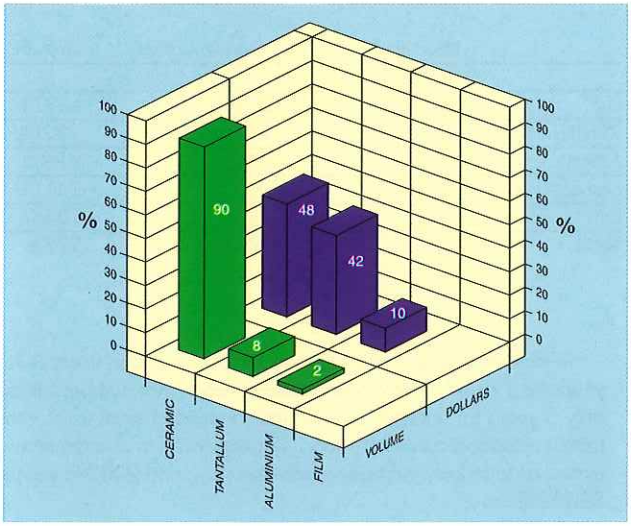

Figure 1: 1998 IBM capacitor purchases: technologies

SMT tantalum capacitors are used extensively, but IBM still has requirements for PTH for 5% of the demand in volume, representing 17% of the dollars spent. Some large high-end products still use PTH circuit boards, although usage is steadily declining. Volume is split 90:10 between non-fused and fused: this ratio was 60:40 two years ago, so there has been a significant increase in the usage of non-fused tantalum capacitors.

The dollars spent on the 10% of components which are fused constitute 20% of the total, so the cost of a fused component is higher than the cost of a non-fused one. Two years ago, the dollars spent on fused tantalum capacitors were more than 60% of the total: the drop to 20% is a point which will be discussed later. A fused SMT capacitor allows the capacitor to fail open when current levels reach the actuation point of the fusing element, thereby eliminating the short circuit failure mode identified with a non-fused tantalum SMT capacitor.

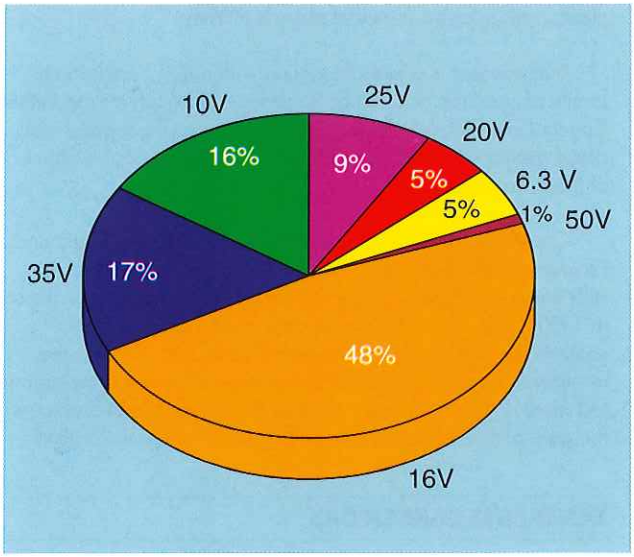

Fig. 2: 1998 tantalum usage profile: voltage ratings

The predominant voltage rating is 16V, followed by 35V and 10V. The use of 16V has been stable over recent years, whereas the use of 35V is increasing. Voltage derating of 2X to 3X is common, for example, a 16V capacitor is used in a 5V application.

A	B	C	D	E
18%	23%	23%	33%	3%

Table 2: Tantalum usage profile: case sizes

IBM uses a wide variety of the case sizes available to the industry. There has not yet been a need in IBM for case sizes smaller than A, space constraints in computers have not yet reached those of a mobile phone. Our predominant case size is still D case, with 33% of the volume bought, followed by B and C at an equal level. In the last two years, B increased significantly whereas C and D remained stable (see Figure 3).

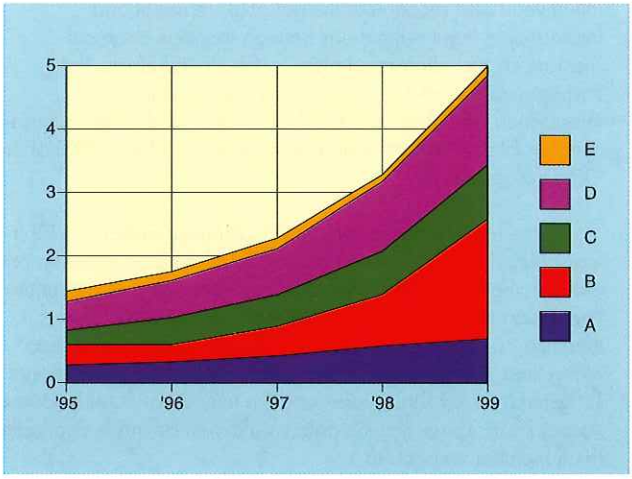

Figure 3: Trends in case sizes

APPLICATIONS

The predominant application is a decoupling function. Voltage derating is common, and the amount of derating often depends on supplier recommendations and on the application itself. It is used to improve the intrinsic reliability of the device. Tantalum capacitors often replace aluminium capacitors when this is dictated by the card manufacturing conditions, because the former are generally more robust.

	Ceramic	Tantalum	Aluminium
Mobiles	300	30	10
Servers	300	125	30
Desktops	320	30	30

Table 3a: Part count estimates for PC products

100µF	10V	D case
47µF	10V	C case
22µF	16V	D case
10µF	16V	B case
4.7µF	10V	A case
330µF	6.3V	X case
220µF	10V	D case

Table 3b: Common values used in PCs

Ceramics have by far the highest part count in typical PC products. This is due to cost, size and versatility. Some of the extensively used CV values in our PCs are shown in Table 3b. The last two are low ESR parts used for the battery applications in PC mobiles and are growing rapidly. Aluminium radials are used extensively for bulk decoupling. PTH devices are used rather than SMT tantalum capacitors – although the latter would be the preferred choice they are not cost effective at this point for this application.

For the power supply in main frame S390, a high-end product family within IBM, ceramics have by far the highest part count, 80% of the total, or 270 out of 320. 10 tantalums and 40 aluminiums make up the balance. The picture is similar for a logic card or a memory card within the S390 machine.

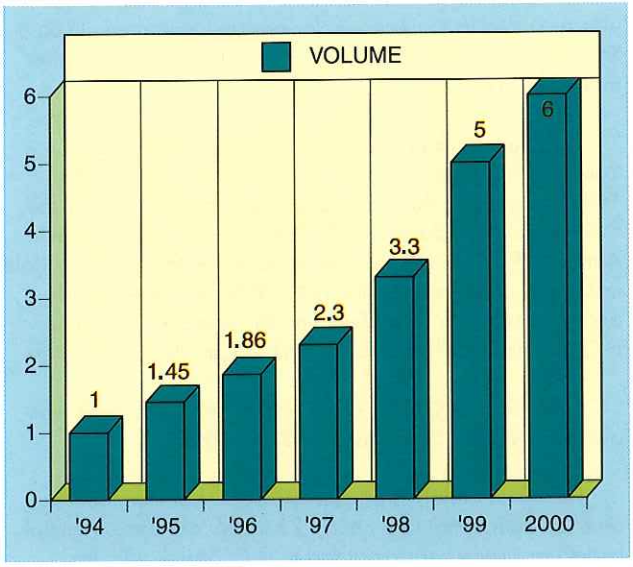

Figure 4: Trends in capacitor use: volume of SMT capacitors

The volume of SMT capacitors has increased in recent years: the volume today is more than three times the volume in 1994. This includes A-business, which is growing rapidly. A-business is done through IBM card sub-contractors which buy components of IBM contracts. The increase is also due to advances in case size reduction, the increased need for SMT components and improvements in quality and reliability. The outlook for 2000 is for six times the volume bought in 1994.

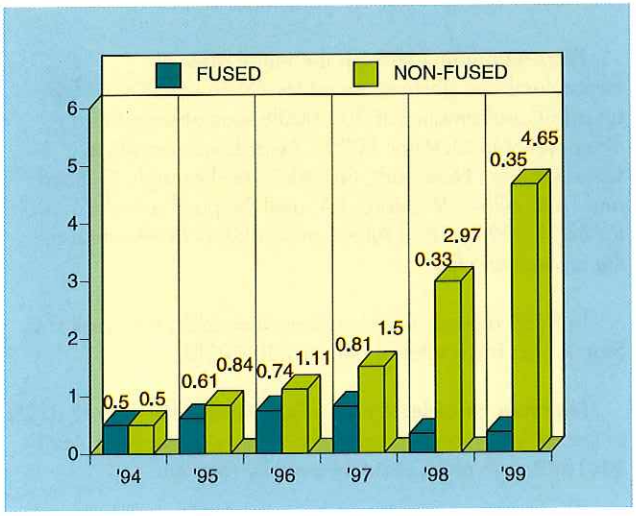

Figure 5: Trends in capacitor usage: volume of SMT fused vs. non-fused

Returning to the choice of fused and non-fused capacitors, Figure 5 shows that overall volumes of tantalum capacitors have increased, and they will continue to do so. The increase in the use of fused capacitors had been kept relatively low until 1997, and in 1998 this usage declined. The difference between fused and non-fused volumes increases year by year. Although fused tantalum capacitors are items that can be found in suppliers' catalogues, IBM probably consumed the bulk of this product.

In an effort to increase supply flexibility and to increase our usage of components that are generally available in the industry, we reviewed our needs for fused tantalum capacitors. The requirements of IBM for tantalum capacitors are based on these factors:

- Smaller case sizes
- Low ESR
- SMT usage will increase
- Reliability and quality
- Environment friendly manufacturing processes and materials
- On time delivery
- Logistics, replenishment
- Cost competitive per CV

A continuing case by case review of applications is made to determine whether fused tantalum capacitors are essential. Candidates which do not benefit from the use of a fused tantalum capacitor are the following:

- Low voltage/low current
- High impedance circuits
- When actuation conditions are not achievable
- When alternative circuit protection is available

Our aim is to have the design needs of IBM correspond more closely with the offer of components by the industry, and to encourage designers to use the preferred technology. This is part of our Technology Convergence project, which is driven at AOP Council level.

In any event, IBM must ensure that reliability and safety are not compromised by the migration away from fused tantalum capacitors.

FUTURE REQUIREMENTS

If we try to project what IBM tantalum capacitor requirements will be, we can say that

- Demand for smaller case sizes will continue to increase, although IBM also maintains a strong need for the larger case sizes to cover its various product requirements
- Growth in the use of low ESR tantalum is expected
- New developments in volumetric efficiency will be needed
- SMT usage will continue to increase over PTH.

Reverse polarity will continue to be a concern to the manufacturing sites: reverse mounted components fail, causing damage to the card assembly.

The reliability and quality of tantalum capacitors have improved dramatically over the years. There was, however, a painful learning curve for both customers and suppliers. We are at a point where our core suppliers are shipping excellent quality levels, and this attention to quality needs to be maintained. Also, attention to environmentally friendly manufacturing processes and materials is a key point for us.

The ability for our suppliers to deliver in time is very critical in our business – especially AOP business. The typical electronic circuit board contains more than 80% of AOP components. In a typical mobile phone, out of 1000 components 925 are AOP components, and of these 400 are capacitors. So the probability of impacting our supply and of causing line-down situations is high. This reinforces the need for excellent delivery performances.

Logistics are changing too. Our manufacturing locations will turn more and more to 'replenishment and pull' logistics based on consumption.

TECHNOLOGY COMPETITION

The prices of computers continue to decline year after year, the competition is very severe. We are going through a very deep cost curve on the products we sell. So our tantalum suppliers need to follow this market cost trend, as do their own suppliers. Otherwise this could make the computer industry inclined to develop alternative solutions to remain competitive. We need continuous supply, and also continuous cost reductions.

Tantalum capacitors must become cost competitive per CV with ceramics and aluminiums. Although there is a potential for growth in the tantalum market, as we saw, it is critical that the competition from ceramic and aluminium be respected. Ceramics and aluminiums have both taken some of the tantalum market, ceramics because they are continually improving dielectrics, and aluminiums as they are improving ESR. Both can offer cost advantages and have the potential to take over market share from tantalum.

There are several factors which influence growth or decline of the market. Cost evolution is one of them, as mentioned earlier. Stability of supply is another. Supply instability or constraints result in double-booking by consumers, with the consequence that supply is destabilised.

CONCLUSION

As a conclusion to this paper, we can say that tantalum capacitors are used throughout the entire IBM product line. The volumes of tantalum capacitors used in our business are projected to increase significantly. Again, this increase is contingent upon cost competitiveness and availability of supply. Total cost is and will remain a priority across all capacitor technologies. IBM's focus remains on Total Cost, Quality, Innovation and Service.

DEFENSE LOGISTICS AGENCY

Tantalum minerals: On December 4th 1998 the DLA announced the award of nearly 98 000lb of contained tantalum in tantalum minerals to Amlon Metals Inc., New York, NY for approximately $5.4 million. This exhausted the amount of tantalum minerals available for sale under the Annual Materials Plan for Fiscal Year 99.

In the Plan for FY98, the available tantalum minerals, also nearly 100 000lb of contained tantalum, were awarded to Cabot Performance Materials on September 28th 1998 for $6.2 million.

Tantalum/niobium concentrates: On August 13th 1999 the DLA announced the cancellation of any further solicitation of offers for tantalum minerals, and opened the solicitation of offers for tantalum/columbium concentrates. 103 324lb contained tantalum, approximately, was offered in the rest of FY99, any amount unsold would be offered in the next fiscal year, subject to approval. Offers were to be received by August 30th, but in an amendment dated August 27th this date was changed to September 8th 1999. The material concerned was acquired in 1981 and 1984 and is stored in galvanized drums in the form of concentrates.

Tantalum oxide: The award of 20 000lb (Ta contained) of tantalum oxide to Recovery Dynamics, Johnson City, TN, was made on June 4th 1999 for an approximate market value of $1.3 million. This exhausts the amount of tantalum oxide available for sale under the Annual Materials Plan for Fiscal Year 99.

Tantalum oxide with 20 000lb of tantalum contained was awarded to Kennametal for approximate market value $1.3 million on October 24th 1998, which completed the available sales in FY98.

Tantalum carbide: H.C. Starck Inc. was awarded 2000lb of tantalum carbide for FY99 on October 28th 1998, exhausting the material initially available under the FY99 Plan. An additional 2000lb were made available in April 1999 but no offers were received by the first offer date in May: a new date of June 15th 1999 was announced, and, according to Metal Bulletin, an award was made to H.C. Starck Inc. of 2000lb for $61.50 per lb Ta contained.

For FY98 2000lb (Ta contained) tantalum carbide was awarded to H.C. Starck Inc. for $131 000.

Tantalum metal, capacitor grade: It was announced on May 20th 1999 that nearly 25 000lb of tantalum metal, capacitor grade, was awarded to H.C. Starck, Inc. for approximately $2 million. This exhausted the amount offered in FY99, the first time such material had been offered.

Tantalum metal, vacuum grade: 25 000lb of tantalum metal, vacuum grade, was made available on May 11th 1999, offers to be received by June 21st; this was the first offer of such material. Metal Bulletin reported that early in July the DLA announced that 16 000lb vacuum grade Ta metal at $1.4m was awarded to Hi-Temp Specialty Metals. A further offering is due for September 20th.

Ferroniobium: Although the initial offer of ferrocolumbium (ferroniobium) for FY99 was 200 000lb, an additional amount of 200 000lb was offered in an amendment in October 1998. Awards were made to Considar, Inc., New York, NY, ABS, Mexborough, England, and Triad Alloys, Wexford, PA, until the purchase of 96 500lb for $604 000 by Triad Alloys on April 2nd 1999 exhausted the amount on offer.

In FY98 awards were made to Considar, Inc., and H.C. Starck, Inc. for a total of almost 200 000lb.

Niobium carbide: A new solicitation of offers for 21 372lb of columbium (niobium) carbide powder was made on April 9th 1999, with offers to be received by May 4th.

Niobium metal: On June 10th 1999 it was announced that approximately 12 000lb of niobium metal under Solicitation of Offer, DLA-COLUMBIUM Metal-001 had been awarded to H.C. Starck Inc., Newton, MA, for an approximate value of $350 000. A new solicitation of offers was made on April 5th 1999 for 20 000lb of niobium metal, vacuum grade, in the form of ingot. A further receipt of offers was due on June 17th 1999.

The new fiscal year begins on October 1st 1999.

MEMBER COMPANY NEWS

BEH Minerals
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Cabot Performance Materials

Cabot Corporation (parent company of CPM) reported on July 28th 1999 that its Board of Directors had authorised management to develop several initiatives designed to enhance shareholder value by achieving proper recognition for the inherent strengths and prospects of several portfolio businesses and by reducing costs in core operations. Management's current plans include an initial public offering of approximately 15% of the company's microelectronic materials business, the issuance of a targeted stock for the liquefied natural gas (LNG) business and the exploration of alternative ownership structures for the company's tantalum materials business (CPM). Additionally, the plan calls for $30-35 million of annual cost reductions to be derived from a continuous improvement program initiated across the company's core businesses.

'Over the past several months', commented Mr Samuel Bodman, Chairman and Chief Executive Officer of Cabot Corporation, 'our management team performed an intensive review of our businesses. Our review came about as part of a continuous improvement program, and was aimed at improving the company's earnings performance and addressing shareholder value creation opportunities that we felt were available. We remain committed to our dual strategy of cost and capacity management and new product and new business development.'

Capital structure initiatives would include the exploration by the management of several possible ownership structures for its CPM business, and an initial public offering, to be made only by means of a prospectus, of the microelectronic materials business. Mr Bodman stated 'We have concluded that our CPM business operates in an industry where merger, consolidation or vertical integration opportunities will best enhance CPM's competitiveness and value.' Cash generated from these initiatives would be used to continue its share repurchase program.

Operating results for the quarter ended June 30th 1999 showed improved year-to-year quarterly earnings in the CPM business, part of the company's Specialty Chemicals and Materials Group. Volume in CPM's business increased by 9% over the equivalent quarter of 1998.
Web site specific to tantalum and niobium products:
www. cabot-corp.com/cpm

Cambior

For the second quarter of 1999 Cambior reported the production of 287 tonnes of niobium as its share from the Niobec mine, to be compared with 270 tonnes in the same period of 1998. Output of ferro-niobium was 287 468 kg for the second quarter, with a total of 581 260 kg for the first half of 1999 (542 804 kg in the first half of 1998). Cambior described the niobium market as having 'remained stable'.

Gwalia

In his quarterly report on Sons of Gwalia Ltd for the three months ending June 30th 1999, Chairman Peter Lalor said that tantalum production was forecast to increase to more than 1 million lb in 1999/2000, due primarily to the upgrade of the Wodgina tantalum plant. The Minerals Division, responsible for production of tantalum among its other materials, had reported an excellent year 1998/99 and was an important part of the company's operations, he added. The continuing demand for tantalum engendered by growth in the use of hand-held electronic instruments such as mobile phones, lap top computers, video cameras and pager systems would result in 'sustainable profitability' of tantalum sales under long-term contracts.

For the quarter, tantalum production was 235 749 lb, and for the full year production totalled 928 533 lb, with record sales of 927 862 lb completed during the year.

The company anticipated producing and selling approximately 1.1 million lb Ta_2O_5 in the financial year 1999/2000, 18% more than in 1998/99. 650 000 lb would come from the Greenbushes mine, and 450 000 lb from the Wodgina mine following its upgrade. Further production increases could be undertaken if the market warranted these.

At Greenbushes an experimental tantalum flotation circuit was on trial: results so far were encouraging and further research was being undertaken. Continuing improvement in process plant productivity and access to good quality ore had resulted in another production record of 741 050 lb of Ta_2O_5 from 1.6 million lb of ore. Redesign of the Cornwall open pit will extend its life to 2002/2003. 'Beyond this, the open cut will be extended to the south into the Central Lode', reported Gwalia.

Capital expenditure to expand the treatment plant at Wodgina had brought nominal capacity to 400 000 lb Ta_2O_5 per annum at current ore grades. The company anticipates that this mine will have a very long life, on geological considerations of the area.

In June 1999 total reserves and resources of Ta_2O_5 were assessed at 75 million lb for Greenbushes and 31 million lb for Wodgina, a substantial increase over previous estimates.

Kemet

For Mr Charles Culbertson II, the company's delegate to the T.I.C., there has recently been a change of contact numbers: tel. +1 864 963 6307, fax +1 864 963 6311.

In the 1999 annual report of Kemet Corporation, containing the balance sheets as of March 31st 1999, Chairman David E. Maguire described the past year as 'extremely challenging for the electronics industry'. Kemet's total sales were $565.6 million, down 15% from fiscal year 1998 but slightly higher than in 1997. Sales of surface-mount tantalum and ceramic capacitors, over 81% of total business, were down 11% in value from 1998, and sales of leaded tantalum and ceramic capacitors were down 29% in value. In March, however, at the end of FY99, new records had been set for both sales and shipments, in terms of units. (Sales in the first quarter of the new fiscal year – April-June 1999 – were reported to be 14% higher than the year before, with increases in the value of sales of both surface-mount and leaded capacitors and demand 'strong'.)

Mr Maguire explained that an oversupply situation had occurred which was just returning to an equilibrium of supply and demand. The number of factors affecting this situation, as well as the magnitude of those factors, had caused oversupply to last longer than expected. These were the Asian economic crisis, which had even affected Japan's normally strong economy, a change in the way manufacturers ordered components so that they did not build up stocks, and an unprecedented rate of decline in average selling prices. Kemet had taken steps, through re-organization, to protect its margins. Meanwhile part of a capital expenditure of $59 million was invested in expansion of capacity for tantalum business units, and further expansion, albeit prudently undertaken, is forecast for the coming year.

48 new tantalum products were introduced by Kemet in FY99, mostly 'CV extensions (more capacity in a smaller package), new case sizes, low-profile models or improved dielectrics'. Kemet was proud of its multiple anode tantalum products aimed to continue its leadership in ultra-low ESR, high-CV products. It had also entered into a long-term agreement with NEC Corporation to manufacture high-performance conductive polymer capacitors, which it terms KO Caps (Kemet Organic Tantalum), and NEC calls NeoCapacitors. These capacitors, in which the traditional MnO_2 is replaced with a conductive polymer, are an excellent choice instead of some aluminium and ceramic devices, the company considers, and production began in April 1999.

Kemet Corporation is the largest manufacturer of solid tantalum capacitors in the world, one of the two fastest-growing segments of the capacitor industry, states the annual report. Exports account for almost 50% of the company's total sales.

In conjunction with the appointment of Mr Charles M. Culbertson II as President and Chief Operating Officer of Kemet Corporation, other changes have been announced. Among these, Mr Harris L. Crowley becomes Senior Vice President, Technology and Engineering, responsible for both Tantalum and Ceramic Business Units, including the development of KO Caps. Mr James P. McClintock transfers from Vice President, Tantalum to VP, US Ceramic Operations, and Mr Richard C. Rickenbach becomes Director, US Tantalum Operations. Dr Daniel F. Persico becomes Vice President of Tantalum Technology.

Kennametal

Completion of the new World Headquarters campus in Latrobe, Pennsylvania, in Kennametal's fiscal year 1998 brought together the global management of sales, marketing, engineering, manufacturing, research and support functions. Hundreds of customers toured the new headquarters and continue to visit this centre of cutting tool science, reports the firm.

Over the years, Kennametal has acquired other companies to complement its traditional offering of high-performance carbide inserts and holders for lathes. Among these, it acquired Hertel AG in 1993 to extend its geographic range, and in November 1997 it made its largest acquisition, Greenfield Industries, to bring in 'the leading North American producer of a wide range of high-speed steel and carbide metalcutting tools'.

Kennametal offers no less than 130 000 metalworking products, including carbide-tipped tools for cutting through coal, rock or pavement in mining, highway construction, oil and gas exploration and drilling. Powder metallurgy and carbide technology provide a vast array of products. Micro mini drills for high-precision applications such as computer circuit board manufacture are probably used in conjunction with other T.I.C. members' capacitor products...

The company's range extends from a drill nearly as fine as a human hair used on plastic replacement corneas by eye surgeons, at one extreme, to snow plough blades at the other.

NEC Corporation

The delegate of NEC to the T.I.C. is Mr Yoshihiko Saiki, Senior Manager, Engineering Department, Energy Devices Division; tel. +81 42 771 0761, fax +81 42 771 0877.

NEC and Kemet Corporation (see above) have entered into a co-operative promotional agreement for NeoCapacitors/KO Caps. NEC is seeing a significant strengthening of demand for these capacitors 'as increasing efforts are made to reduce the power consumption of electronic circuitry, and expects monthly sales to rise from a current 20 million to reach 30 million units by the year 2000'. The company offers a 'comprehensive line-up' of conductive polymer capacitors and also new NeoCapacitors highly suitable for smoothing applications in portable telephone and audio equipment, and another model ideal for notebook personal computers. NeoCapacitors were presented in a paper at the T.I.C.'s International Symposium in Goslar, 1995, see Proceedings, pp. 177-194.

(web site www.ic.nec.co.jp/compo/cap/english)

Nichicon Tantalum

e-mail: chijiki@nichicon.co.jp

Osram Sylvania

Following the retirement of Mr James Christini, the delegate of Osram Sylvania to the T.I.C. is now Mr Eric F. Husted, Engineering Manager, Refractory Metals Area. His telephone number is +1 570 268 5378, his fax +1 570 268 5383, and e-mail eric.husted@sylvania.com.

Seco Tools

As one of the world's leading manufacturers of cutting tools, Seco Tools makes 'efforts to maintain an active presence in fast-growth markets throughout the world'. To this end it has reached an agreement to acquire the cemented tools operations of Pramet in the Czech Republic, subject to approval by the relevant authorities, which will strengthen its position in Central and Eastern Europe. Pramet, with plants in Sumperk in the northern part of the Czech Republic, began production of cemented carbides in 1933 and was privatized in 1992. Investment in research and development, as well as modernization of the product range, have made Pramet 'a leading producer of modern cutting tools for industrial applications in the Czech Republic and Slovakia, and sales networks have been established in several European countries', notes Seco Tools.

To strengthen its position in the sub-continent, Seco Tools is also planning to acquire a 75% holding in Drillco Hertel Ltd, based in Pune. This is a leading producer of tools for the automotive industry in India, and has built up its production of cemented carbide tools and a nationwide sales and technical support organization.

Web site: www.secotools.se
e-mail: bernt-westin@secotools.se

Siemens Matsushita Components/EPCOS

Manufacturing tantalum capacitors among other products, Siemens Matsushita Components was formed in 1989 as a joint venture of Siemens and Matsushita. Since that time the company has 'successfully positioned itself in the market and joined the world's leading vendors of electronic components'. Following its integration with other parts of Siemens' Passive Components and Electron Tubes Group, a joint-stock corporation is to be formed in September 1999, and when the new fiscal year begins on October 1st 1999 the company will be renamed EPCOS AG.

Product information can be obtained from CD-ROM Data Book Library 1999, see www.siemens.de

H.C. Starck by e-mail

Addresses for e-mail to Dr Hoppe at H.C. Starck GmbH & Co KG and Dr Bonjer at H.C. Starck (Thailand) Co., Ltd are axel.hoppe.ah@hcstarck.de and JURGEN.BONJER.JB@bayer-ag.de, respectively.

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H.C. Starck - V Tech

e-mail: HIROO.NAITO.HN@bgj.bayer.co.jp

Alex Stewart (Assayers)

Alex Stewart (Assayers) Ltd (ASA), the independent supervision and analytical services company based on Merseyside UK, is proud to announce that it has undertaken a considerable programme of expansion in 1999. In order to better serve the exploration market, facilities have been developed in Mendoza, Argentina, Kara-Balta, Kyrgyzstan and lately in Loughrea, Ireland. ASA has also opened new offices in Buenos Aires, Moscow, Odessa, Poti, and UAE, and a branch office will open in Shanghai later this year. These offices will serve commercial clients in a wide range of commodities from metals and minerals to soft commodities. ASA now has offices in more than 45 countries worldwide and firmly believes that its recent expansion will place it in a much stronger position to offer all clients throughout the world a professional, broader and fully integrated service.