

BRUSH ENGINEERED MATERIALS INC

FORM 8-K (Unscheduled Material Events)

Filed 9/3/2003 For Period Ending 9/3/2003

Address	17876 ST. CLAIR AVE. CLEVELAND, Ohio 44110
Telephone	216-383-4062
CIK	0001104657
Industry	Metal Mining
Sector	Basic Materials
Fiscal Year	12/31

SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM 8-K

CURRENT REPORT

Pursuant to Section 13 or 15(d) of the
Securities Exchange Act of 1934

Date of report (Date of earliest event reported): September 3, 2003

BRUSH ENGINEERED MATERIALS INC.
(Exact Name of Registrant as Specified in Charter)

Ohio
State or Other Juris-
diction of Incorporation)

001-15885
(Commission
File Number)

34-1919973
(IRS Employer
Identification No.)

17876 St. Clair Avenue
(Address of Principal Executive Offices)

Cleveland, Ohio

44110
(Zip Code)

Registrant's telephone number, including area code: (216) 486-4200

Item 9. Regulation FD Disclosure

On September 2, 2003, Brush Engineered Materials Inc., an Ohio corporation (the “Company”), updated the “Current Investor Update,” a slide presentation on its website, a copy of which is attached hereto as Exhibit 99.1. This slide presentation shows the Company’s corporate strategy and the financial results through the second quarter of 2003.

SIGNATURES

Pursuant to the requirements of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned hereunto duly authorized.

BRUSH ENGINEERED MATERIALS INC.

Date: September 3, 2003

By: /s/ Michael C. Hasychak
Vice President, Secretary and Treasurer

INDEX TO EXHIBITS

<u>Exhibit Number</u>	<u>Description of Exhibit</u>
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99.1	Current Investor Update
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Brush Engineered Materials Inc.

Profile

- Publicly traded since 1956: NYSE-listed since 1972.
- Founded 1931 as Brush Beryllium Company.
 - Building off earlier pioneering technical work at Brush Laboratories
 - Initial scope was development of commercial markets
- With onset of WW II and post war period, significant growth in defense and eventually, aerospace applications
- Mid-70s: major expansion of new commercial markets.
- Today, commercial markets represent 90% + of revenues



Brush Engineered Materials Inc.

Profile

- Leading manufacturer of high performance engineered materials
- Operations, service centers and major office locations in North America, Europe and Asia
- Serving long-term growth oriented global markets:
 - Telecommunications and computers
 - Automotive electronics
 - Optical media



Brush Engineered Materials Inc.

“Advancing the World’s Technologies”

- BEM Materials are found in a wide range of critical and demanding applications requiring:
 - Strength
 - Reliability
 - Thermal & electrical conductivity
 - Miniaturization
 - Weight reduction
 - Power distribution
 - Reflectivity



Brush Engineered Materials Inc.

End Uses

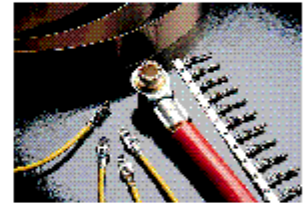


Notebook and network computers

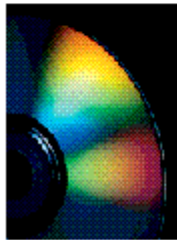
Cellular phones and other wireless communications



Electronic components in cars and trucks



Life enhancing devices



Optical Media

Industrial products



Brush Engineered Materials Inc.
Organized into Two Separate Reportable Segments

Metal Systems

Brush Wellman Inc. (Alloy Products and Beryllium Products)

Technical Materials, Inc.

Microelectronics

Williams Advanced Materials Inc.

Electronic Products



Brush Engineered Materials Inc.

Unique Capabilities from Mine to Value Added Material

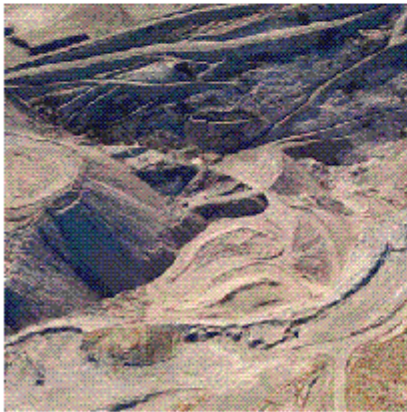
Metal Systems

World's only fully integrated producer of beryllium, beryllium-containing alloys and beryllia ceramic.

High beryllium metals, ceramics and beryllium alloys

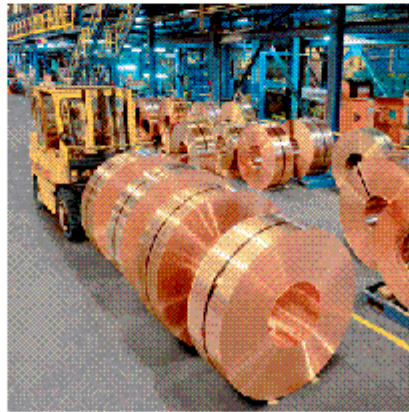
Delta, UT

Bertrandite Ore
Mining & Extraction



Elmore, OH

Casting, Rolling &
Finishing



Reading, PA

Thin Gauge Rolling
& Finishing



Unique Capabilities from Mine to Material

Diverse in Scope and Product

Metal Systems

Alloy Products

- Manufactures strip products which are primarily copper beryllium and nickel beryllium alloys and bulk products which are copper, nickel and aluminum-based alloys manufactured in rod, bar, tube, plate and other customized forms.

Beryllium Products

- Manufactures pure beryllium and beryllium aluminum alloys

Technical Materials, Inc. (TMI)

- Manufactures engineered material systems including clad metals, plated metal, electron beam welded, solder plated and reflow materials.

Microelectronics

Williams Advanced Materials (WAM)

- Produces precious metal and specialty alloy products

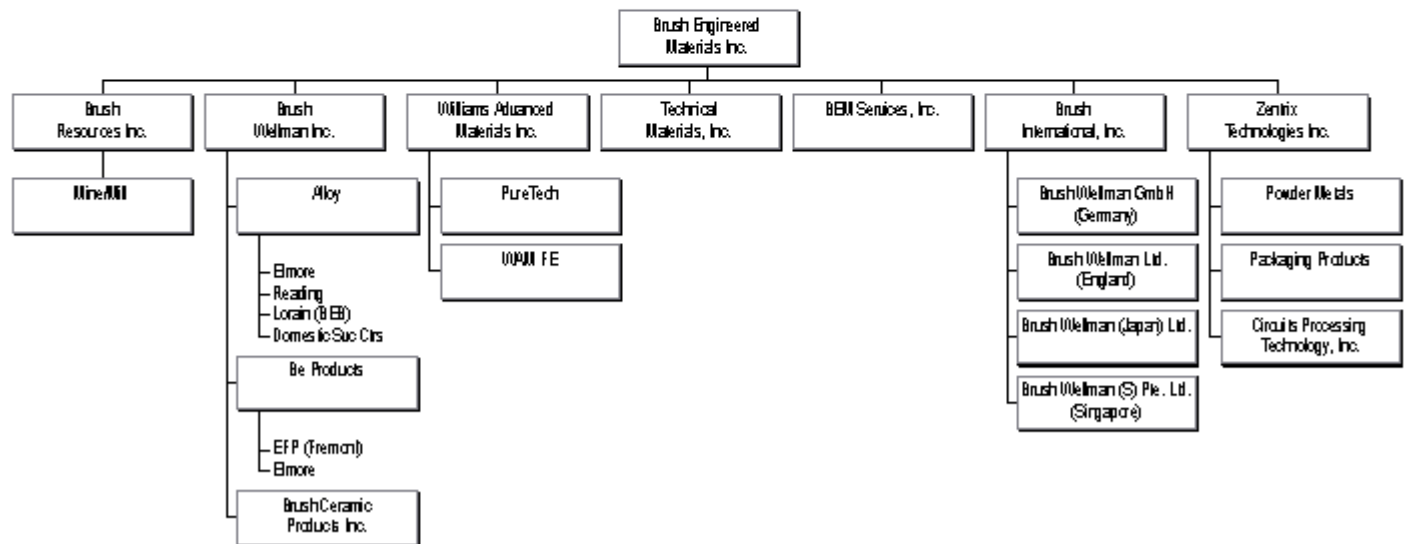
Electronic Products

- Electronic packaging, circuitry and powdered metal products

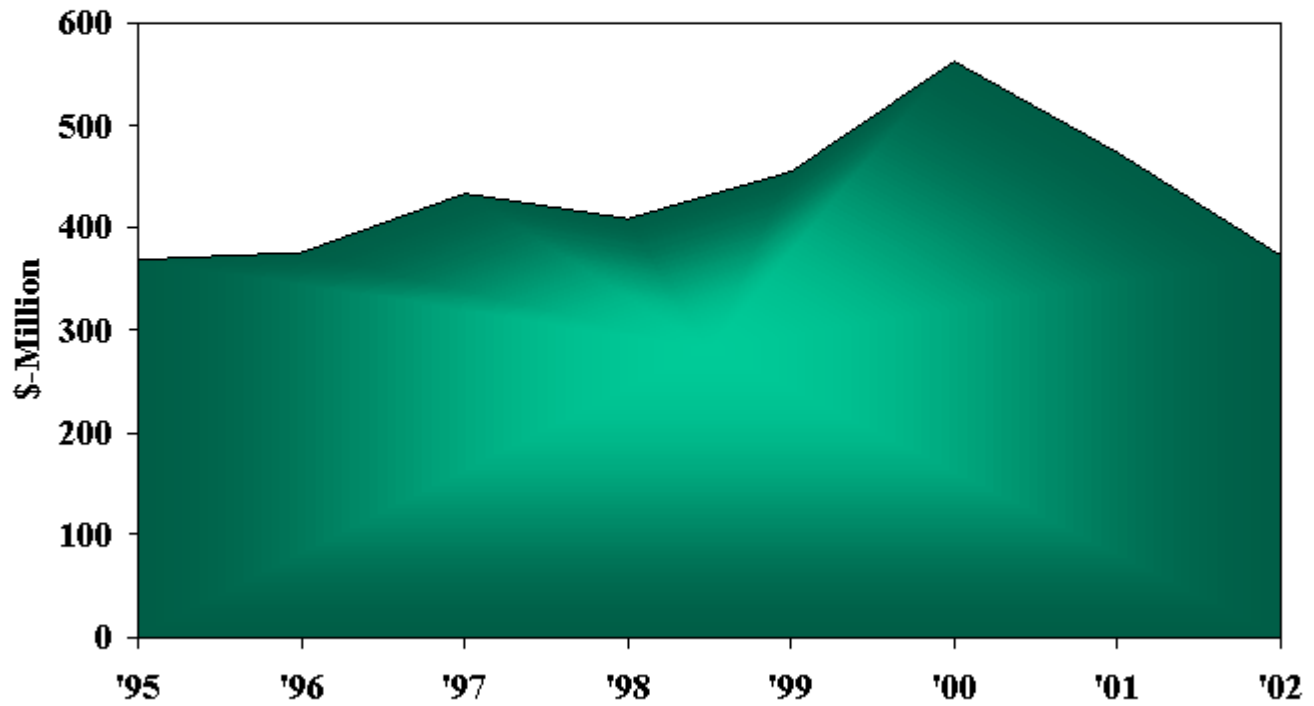


Corporate Structure

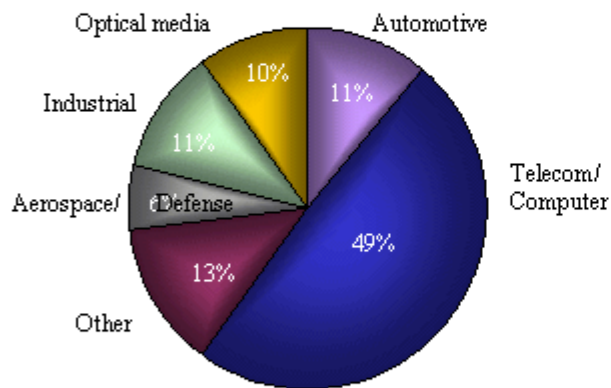
May 16, 2000 Brush Engineered Materials Inc. became the publicly-traded Parent Company of Brush Wellman Inc. On January 1, 2001 Phase II of the Company's reorganization was completed with the creation of three new entities: Brush Ceramic Products Inc., Brush Resources Inc. and Zentrix Technologies Inc.



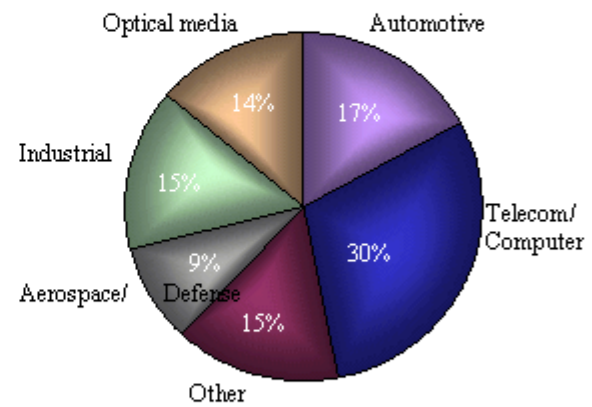
Sales Have Declined to mid-90's Levels



The portion of Brush's revenue from the telecom/ computer market has declined from nearly 50% to slightly more than 30%

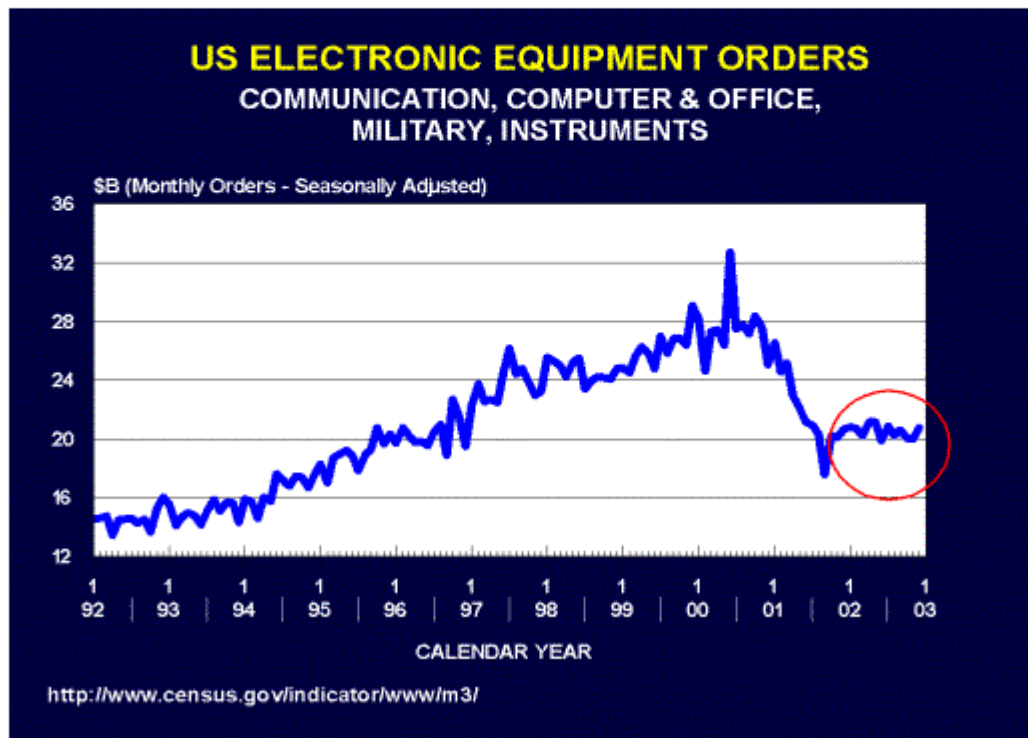


2000

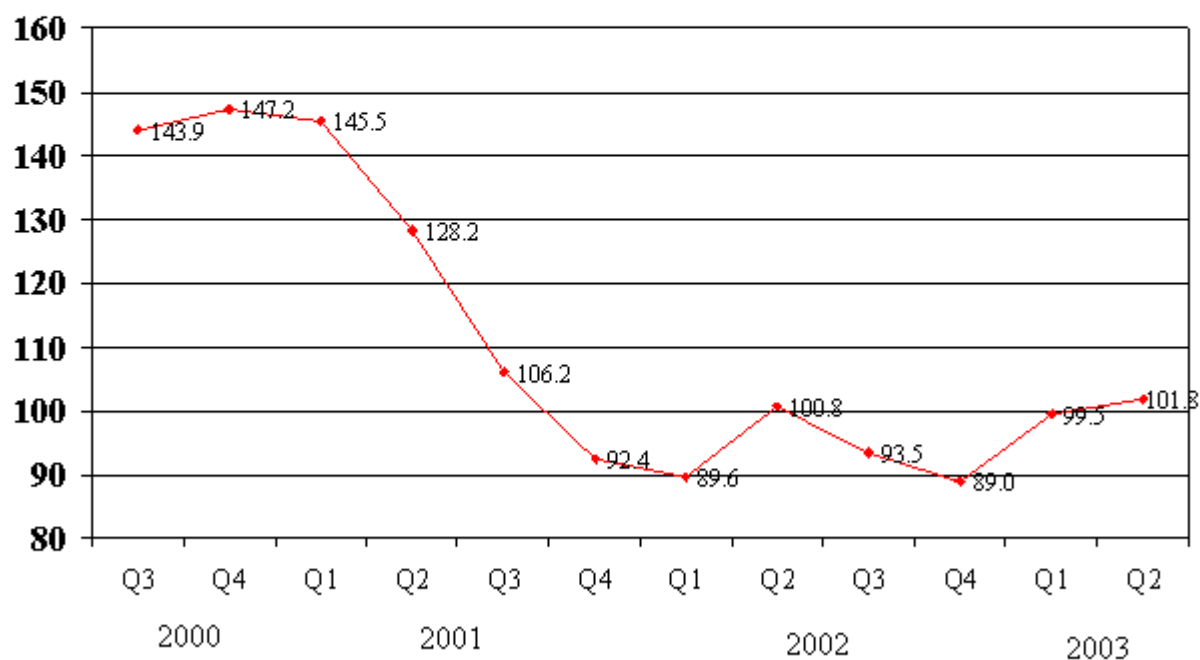


2002

US Electronic Equipment Orders



Brush experienced a major downturn in Q-2 and Q3 2001, with revenue remaining flat since



As a result, significant losses occurred in the second half 2001 through 2002

In \$-million, except for per share data

	2002			
	<u>Q-1</u>	<u>Q-2</u>	<u>Q-3</u>	<u>Q-4</u>
Net Sales	\$89.6	\$100.7	\$93.5	\$89.0
Net Income	(3.8)	(2.0)	(2.9)	(26.8)
Per Share/ Diluted	(0.23)	(0.12)	(0.18)	(1.62)

*Q-4 2002 includes impact of deferred tax asset impairment, electronic products restructuring and a charge for other non-used assets.

Through this period, variable margins have improved, despite the fall in revenue

<u>Year/Quarter</u>	<u>Variable Margin%</u>
2000	39.7%
2001	40.2%
2002	40.3%
YTD Q2-2003	42.0%

Major 2002 Fourth Quarter “Events”

- Electronic Products restructuring \$ 2.0 million
 - Write-down of Be Products assets \$ 3.1 million
 - Deferred tax-asset impairment \$19.9 million
 - Unfunded Pension Plan \$13.6 million
-

Brush significantly reduced its breakeven point during 2001 and 2002

\$-Million

	<u>2001</u>	<u>2002</u>	<u>01-->02</u>
Fixed Costs			
Mfg. Overhead	\$121	\$102	\$(19)
SG&A+interest	<u>87</u>	<u>69</u>	<u>(18)</u>
Total	208	171	(37)
Contribution Rate	40%	40%	
Breakeven Sales	\$520	\$420	\$(100)

Notes: Based on 2002 mix and metal prices

SG&A + interest for 2002 excludes \$5.1 million of one-time charges

Breakeven was achieved in the second quarter of 2003

\$-Million

	<u>Q1-03</u>	<u>Q2-03</u>
Fixed Costs		
Mfg. Overhead	24	\$25
SG&A+interest	<u>19</u>	<u>18</u>
Total	43	43
Contribution Rate	41%	43%
Breakeven Sales	\$105	\$100

Headcount has been reduced by 26%

Employment as of:	<u>12/31/00</u>	<u>12/31/01</u>	<u>12/31/02</u>	<u>% Change</u>
Alloy	1,221	832	792	(35%)
All Others	<u>1,279</u>	<u>1,114</u>	<u>1,070</u>	<u>(16%)</u>
Total	2,500	1,946	1,862	(26%)

Total balance sheet debt, off balance sheet leases and precious metal lease obligations were reduced approximately \$50M, or 26% from December 2001 through June 2003

Operating Cash Flow

\$-Million

	<u>OP</u>	<u>Depr</u>	<u>Capex</u>	<u>Change in A/R</u>	<u>Change in Inventory</u>	<u>Operating Cash Flow</u>
2000	\$23	\$23	\$(21)	\$(13)	\$(8)	\$4
2001	(14)	21	(23)	38	7	29
2002	(23)	21	(5)	7	17	17
2003 YTD	(1)	10	(4)	(11)	3	(3)

Alloy has made significant progress

- Working Capital
 - Reduced 41% (\$64M) since Q-1 2001
 - Expense Control
 - Manpower reduced by 35% since Q-1 2001
 - Manufacturing overhead and SG&A 29% lower in Q-2 2003 vs. Q-1 2001
 - Operations improvements since Q-1 2001
 - Safety (OSHA recordable) rate improved by 70% in manufacturing
 - Strip rework rate improved 63%
 - On-time shipments to Service Centers 63% higher, along with 44% improvement in replenishment times to the service centers
-

*TMI has responded aggressively to
the market downturn*

Technical Materials, Inc.

	<u>Q-1 2001</u>	<u>Q-4 2002</u>	<u>% Change</u>
Revenues in \$M	\$21.0	\$10.0	(52%)

- Significant reduction in cost, above breakeven
 - Variable cost – down by \$4.3M over 21 months
 - Workforce reduced by 35%
 - Innovative partnership with State Workplace Program
 - Major reduction in supply and maintenance cost
 - Fixed cost – down by \$4.7M over 21 months
 - Operational improvements
 - 21% increase in productivity
 - 3% yield improvement
-
-

Electronic Products Restructured

	<u>Q-1 2001</u>	<u>Q-4 2002</u>	<u>% Change</u>
Revenues in \$M	\$11.5	\$7.9	(31%)

Electronic Products restructuring: (\$2.0 million charge in Q-4)

- Cost reduced, central structure eliminated (20 people), \$3.0 million annual benefit
- PMP assets written down to market value
- Newburyport unit reports into WAM
- CPT and BeO operations report into Beryllium Products

Lean/Six Sigma programs focused on operational improvements

WAM is also generating favorable results

- Sales up, with value added showing a moderate increase
 - Good growth in PVD, especially optical markets
 - Strong earnings and cash flow
 - Reduced inventories, including consigned metals, by more than \$6M in past year
-

Beryllium Products continues to perform strongly

- Revenue improved 13% first half 2002 to 2003
 - Continuing strength in military/defense offsets weakness in commercial markets (e.g. x-ray equipment)
 - Margins improving
 - Operating profit increased by 50% over the same period
-

Corporate costs have also been reduced

- Dividend suspension
 - Benefit changes/401-K
 - Wages frozen
 - Service cost reductions
 - Legal expenses and cases down
-

Longer term outlook for our engineered materials is attractive

- Higher performance requirements growing
 - Electrical
 - Thermal
 - Mechanical
 - Fatigue resistance
 - Corrosion resistance
 - Strength
 - Anti-galling
-

*For example, Alloy is aggressively
working to broaden its base*

New Products

Strip New Product Forms

New Strip Alloys

MoldMax® XL

ToughMet™

Undersea Housings

Applications/Markets

Tubing, Bearings and other
special applications

- Oil and Gas

- Instrumentation

Electronics Market

Plastics Tooling

Bearings and Wear
applications

Marine and Power systems

Keys to returning to profitability in 2003 and beyond:

- Improving margins through operational efficiency
 - Lean manufacturing
 - Six Sigma
 - Further overhead reductions
 - Broaden the base – new revenue
 - Improvement in demand from the telecom/
computer market
-

Summary

- Cash flow is expected to be positive through continued working capital reductions and minimal capital spending
 - Downturn of key end-use markets is unprecedented
 - Brush is not content to “wait it out”
 - Long-term prospects bright
 - Brush Engineered Materials is well positioned to capitalize on this growth
-

Segment Sales Review 2002-2003

		2001		2002		YTD 2003	
		% sales	\$	% sales	\$	% sale	\$
➤	Metal Systems Group	296	62%	228	62%	122	61%
	- Alloy	217	45%	152	41%	82	41%
	- Beryllium Products	29	6%	32	9%	23	11%
	- TMI	50	11%	44	12%	17	8%
➤	Microelectronics Group	170	36%	139	37%	76	38%
	- WAM	135	28%	109	29%	60	30%
	- Electronic Products	35	8%	30	8%	16	8%
➤	Other	7	2%	6	1%	3	1%
	TOTAL	473	100%	373	100%	201	100%



Segment Sales Review 2002

	<u>Q1 2002</u>		<u>Q2 2002</u>		<u>Q3 2002</u>		<u>Q4 2002</u>	
	\$	% sales	\$	% sales	\$	% sales	\$	% sales
▪ Metal Systems Group	56	62%	64	63%	57	61%	51	57%
– Alloy	38	42%	41	41%	38	40%	35	39%
– Beryllium Products	6	7%	10	10%	8	9%	8	9%
– TMI	12	13%	13	12%	11	12%	9	10%
▪ Microelectronics Group	34	38%	34	34%	34	37%	36	41%
– WAM	26	29%	27	27%	27	29%	28	32%
– Electronic Products	8	9%	7	7%	7	8%	8	9%
▪ Other	<u>0</u>	<u>0%</u>	<u>3</u>	<u>3%</u>	<u>2</u>	<u>2%</u>	<u>2</u>	<u>2%</u>
TOTAL	90	100%	101	100%	93	100%	89	100%

Segment Sales Review 2003

	<u>Q1 2003</u>		<u>Q2 2003</u>	
	\$	% sales	\$	% sales
▪ Metal Systems Group	61	62%	61	60%
– Alloy	40	40%	42	41%
– Beryllium Products	12	12%	11	11%
– TMI	9	9%	8	8%
▪ Microelectronics Group	38	38%	38	37%
▪ WAM	30	30%	30	29%
– Electronic Products	8	8%	8	8%
▪ Other	<u>0</u>	<u>0%</u>	<u>3</u>	<u>3%</u>
TOTAL	99	100%	102	100%



Segment Earnings 2000 - 2003

	<u>2000</u>	<u>2001</u>	<u>2002</u>	1st half <u>2003</u>
Metal Systems Group	10.2	(20.1)	(28.2)	(6.2)
Microelectronics Group	8.4	4.5	5.5	6.0
Other	<u>4.4</u>	<u>1.5</u>	<u>(.2)</u>	<u>(.9)</u>
Total Segment EBIT	23.0	(14.1)	(22.9)	(1.1)



Segment Earnings 2002-2003

	2002				2003	
	<u>Q1</u>	<u>Q2</u>	<u>Q3</u>	<u>Q4</u>	<u>Q1</u>	<u>Q2</u>
Metal Systems Group	(8.5)	(5.1)	(10.0)	(8.9)	(3.4)	(2.8)
Microelectronics Group	2.2	1.5	1.3	(.6)	2.5	3.5
Other	<u>.8</u>	<u>1.0</u>	<u>4.8</u>	<u>(1.4)</u>	<u>(1.2)</u>	<u>.3</u>
Total Segment EBIT	(5.5)	(2.6)	(3.9)	(10.9)	(2.1)	1.0



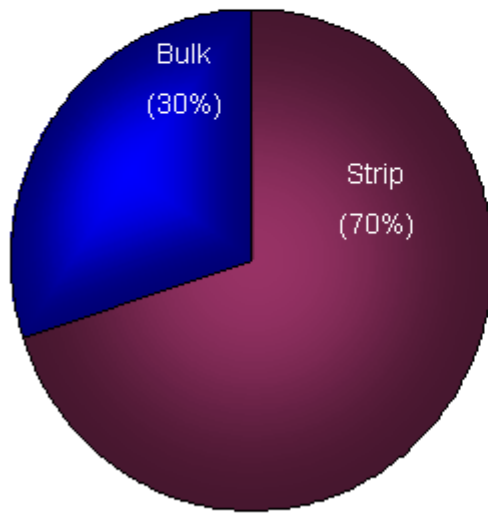
Brush Wellman Alloy Vision

Brush Wellman is the leading supplier of High Performance Copper Alloys worldwide, providing manufacturing excellence in the form of high reliability products and services to satisfy our customers most demanding applications. We provide these services in a culture of local support and global teamwork.

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Alloy Products Markets

2002



- Strip Markets
 - Telecommunications
 - Computers
 - Automotive Electronics
 - Appliance
- Bulk Markets
 - Plastic molds
 - Undersea
 - Aerospace
 - Oil and gas
 - Mining/Heavy equipment
 - Bearings

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Alloy Products

Strip product forms & applications

- **Product Forms**

- Typically thinner gauge than 0.025" (0.6 mm)
- Typically supplied in coils of 1/2" - 2" wide
- Typically delivered in quantities of 20 - 12,000 lb/order
- Always manufactured to customer specified and frequently customized combinations of properties.
- Supplied either as ready to stamp and use, or for customer to heat treat after stamping to obtain specific properties.

- **Strip Products**

- | | |
|---|--|
| – Stamped and formed conducting spring components | - Electronic connector terminals |
| | - Automotive wiring harness terminals |
| | - Electrical relay and switch contacts |
| – Stamped and formed mechanical components | - Thermostat and pressure sensor bellows |
| | - Shielding Strips |
| | - Microprocessor Sockets |

- **Rod & Wire**

- | | |
|-----------------------------------|-------------------------------------|
| – Swiss machine turned components | - Microprocessor PGA sockets |
| – Cold headed components | - High frequency coaxial connectors |

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Alloy Products

Strip Products - Strategy

- **Maintain focus on 4 major end-use markets**
 - Computer Telecommunications Automotive Appliance
- **Defend market leadership in traditional alloy strip, rod & wire**
 - Reduce total cost of manufacture to allow penetration of mid-range alloy applications
 - Enhance product properties to provide additional value to customers
- **Introduce new alloys to meet needs of targeted market opportunities.**
 - Brush 60, ToughMet Strip, Alloy 390
- **Focus on new non-connector markets**
 - Deep Offshore Oil and Gas, Bearings, Instrumentation Tubing, Heat Exchanger Tubing
- **Geographic Growth**
 - Expand commercial operations in Asia Pacific

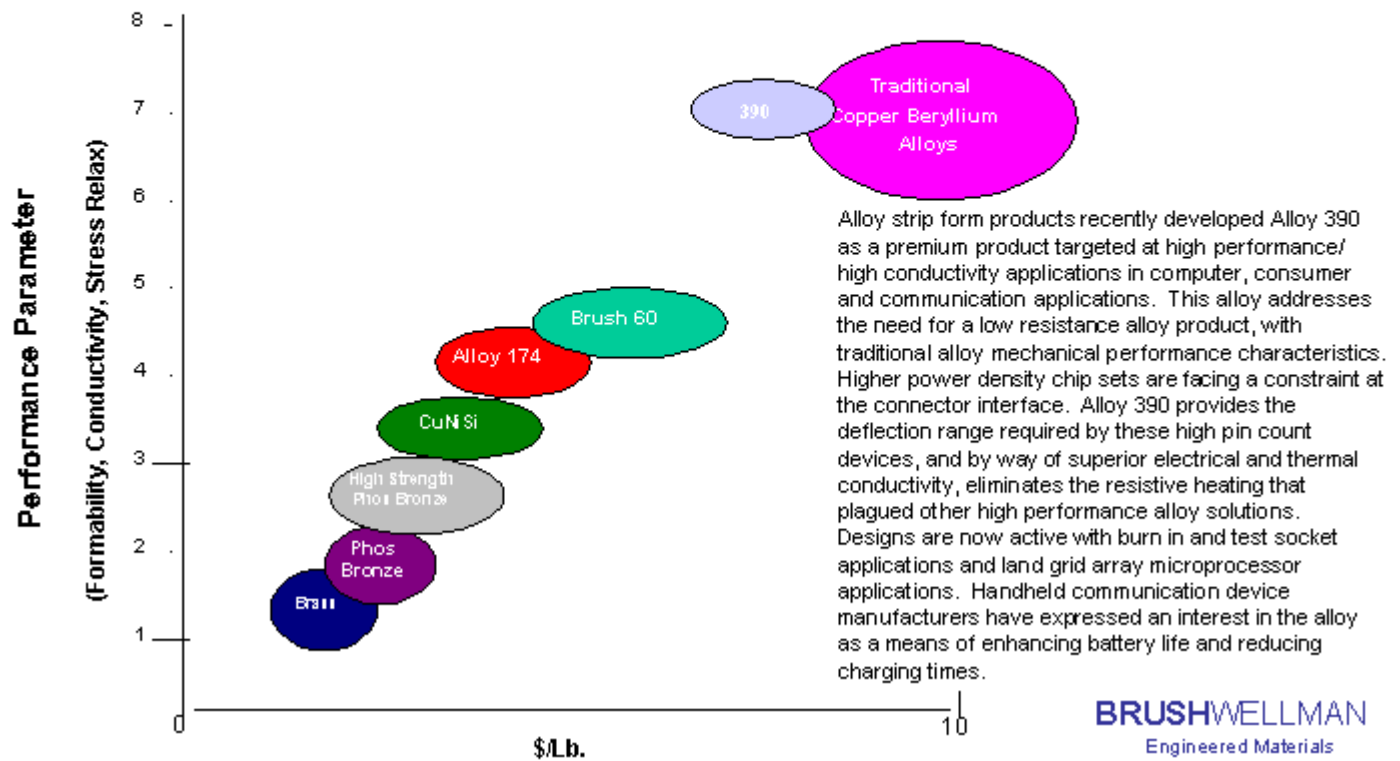
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Strip Capacity Expansion Elmore and Reading Facilities



- \$140 Million
- Added casting, hot rolling, annealing and cold rolling capacity at Elmore
- Added light gauge strip and mill hardening capacity at Reading
- 50% to 100% capacity increase depending upon product

Competitive Alloy Comparison & Strategy



Automotive Electronics

Definition: power and signal distribution in passenger cars and light trucks - connectors, switches and relays

Automotive Applications

Potential New Applications:

- Infotronics/telematics - in car multimedia systems and mobile communication systems, navigational, global positioning, internet based services.
- Powertrain electronics - in vehicle networks, drive-by-wire systems, continuously variable transmission, intelligent braking
- Safety systems - intelligent air bag systems, driver alertness monitoring, adaptive cruise control, frontal collision warning, intelligent highway vehicle systems, automatic emergency notification
- 42 Volt Powernet - increase number of terminals, switches and relays used in a vehicle; shift mix of components size toward miniaturization due to smaller current and increase the number of performance critical systems in a vehicle.

Computer

Definition: Brush Wellman's high performance alloys are sold to the computer industry in strip and wire forms for connectors, contacts, and shielding. End use applications include servers, workstations, notebook and desk top computers, personal digital assistants (PDAs), and data storage devices.

Computer Applications

Examples of specific end-use product applications

- Fingerstock shielding used in servers and data storage.
- Power connectors used in server power supplies manufactured by Sun, HP, Compaq, and Intel.
- Microprocessor socket connectors.
- PDA ID connector and battery contacts.
- VHDM connector system for EMC data storage systems.

Examples of future target product applications

- Intel and AMD's Pentium 5 microprocessor connectors.
- Power connectors for multi-chip module interfaces as well as backpanel power applications in high end servers.
- High pin count and high density flex circuit interface connectors for high resolution flat panel displays.

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Telecommunications

Definition: Brush Wellman's high performance alloys are sold to the telecommunications industry in strip and wire forms for connectors, contacts, shielding, switches and relays. End use applications include wireless base stations, cell phones, pagers, telecom switching equipment, transmission equipment and communication networks.

Telecommunication Applications

Examples of specific end-use product applications

- Handheld and portable device battery clips, antenna clips, I.O. connectors, board to board connectors, SIM card connectors & display connectors.
- Category 6 modular jacks for connecting data networks.
- Shielding gaskets and clips for EMI protection.
- Coaxial switches for cable company central office switches.
- VHDM connector system used in backpanel connector systems for fast Ethernet and Gigabit Ethernet switches and routers.

Examples of future target product applications

- Category 7 modular jacks for data networks.
- Low profile board to board connectors for wireless handsets and high speed mezzanine connectors for network switches and routers.

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Cellphone Connector Applications



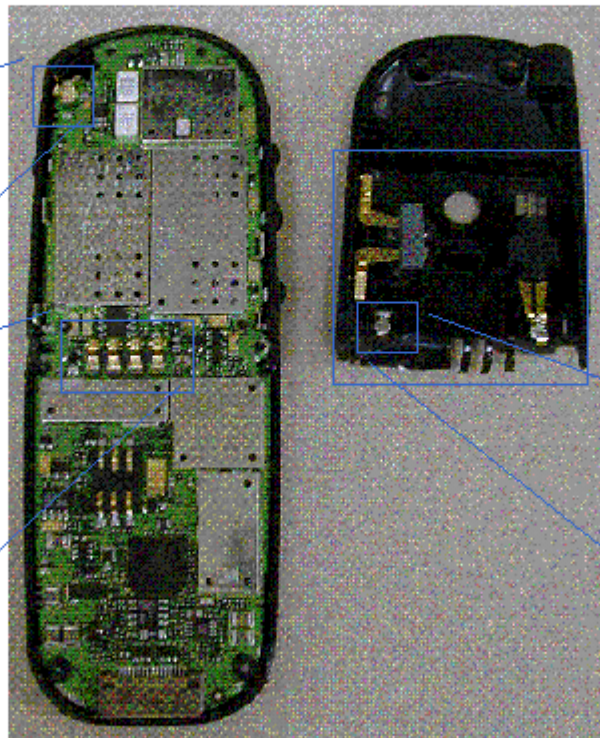
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Rear of Circuit Board

Antenna Contact
Brush Wellman Alloy



Battery Contacts
Brush Wellman Alloy

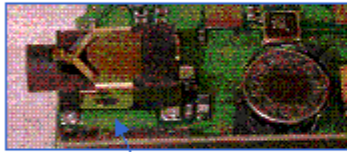


Vibrator Motor Contacts
Brush Wellman Alloy

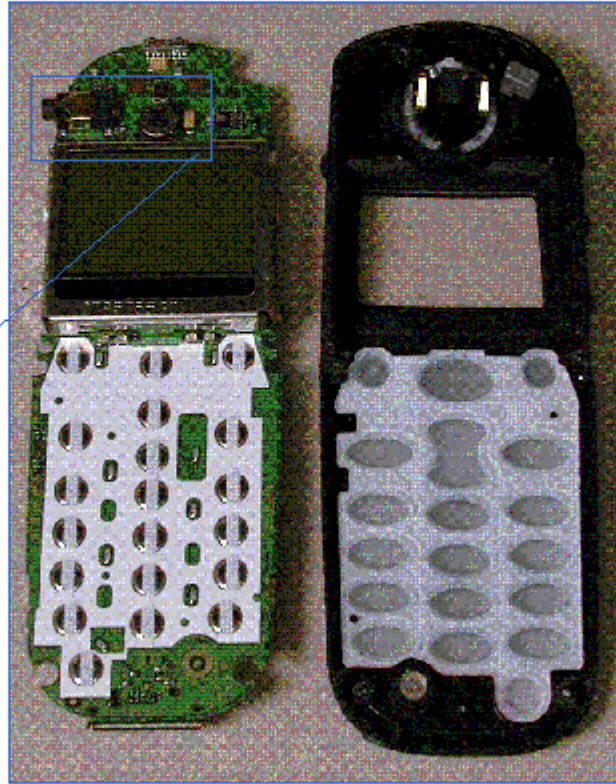


Battery Clips
Brush Wellman Alloy

Front of Circuit Board



Hands Free Set
Connector
Brush Wellman Alloy
and other material



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Alloy Products

Bulk Products - Product forms & applications

- **Product Forms**

- Any shape other than strip
- Typically supplied as Rod, Bar, Thick or thin walled Tube, Plate, Casting Ingot, Forging Billet - or as a custom fabrication.
- Supplied either as ready to machine and use, or for customer to heat treat after machining to obtain specific properties.

- **Applications**

- Plate: Plastic molds; Metal casting molds
- Rod/Bar: Aero bearings; Electrical welding electrode holders;
Mechanical fittings; Plastic mold heat conductors
- Tube: Aero bearings; oil & gas drilling instrumentation casings;
- Casting Ingot: High strength/conductivity foundry castings
- Master Alloy: Aluminum and Magnesium refinery additives

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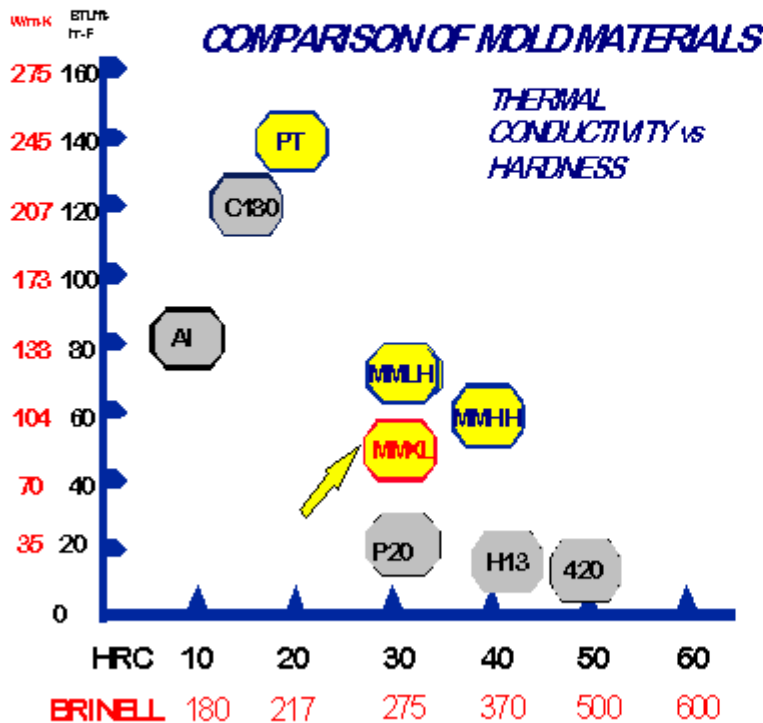
Alloy Products

Bulk Products - Strategy

- **Maintain focus on traditional end-use markets**
 - Oil & Gas Aerospace Plastics Undersea
- **Introduce new alloys or product forms to meet needs of targeted market opportunities.**
 - MoldMax XL
 - ToughMet and improved ToughMet products (CD ToughMet)
 - Alloy 310 RWMA class 3
- **Focus on new non-traditional growth markets**
 - Bearings, Oil & Gas completions, Heavy Equipment & Mining, Pumps, Marine, Heat Exchangers
- **Geographic Growth**
 - Expand commercial operations in Asia Pacific, improve customer awareness and distribution

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Engineered Materials

Plastics - Moldmax XL



- Similar properties to dominant tooling materials and standard Moldmax
- Productivity similar to Moldmax (CuBe) of 30%
- No EH&S issues
- Value proposition includes machinability >5X steels adding cost benefits to offset increased material costs

Value proposition - no added cost for faster cycles and lower cost manufacturing

BRUSHWELLMAN
Engineered Materials

Lorain Casting Facility

Spinodal and Equacast™ Technology-Winning!

High performance Copper based engineered materials:

- Strength and hardness found in CuBe products
- Thermal conductivity

The value proposition differentiates:

- No EH&S issues
- Corrosion resistance
- Superb tribological properties (low friction coefficient, excellent wear resistance - without lube) adding value in Reliability,Uptime, and Less Mtce.
- Machinability and Design Simplicity adding cost benefits to offset increased material costs
- Casting capability including size, shapes, tubes and quality

Developing Applications in the markets we are strong:

Mold Tooling, Aircraft Parts, Drilling Equipment

Developing markets/applications where technology is strong:

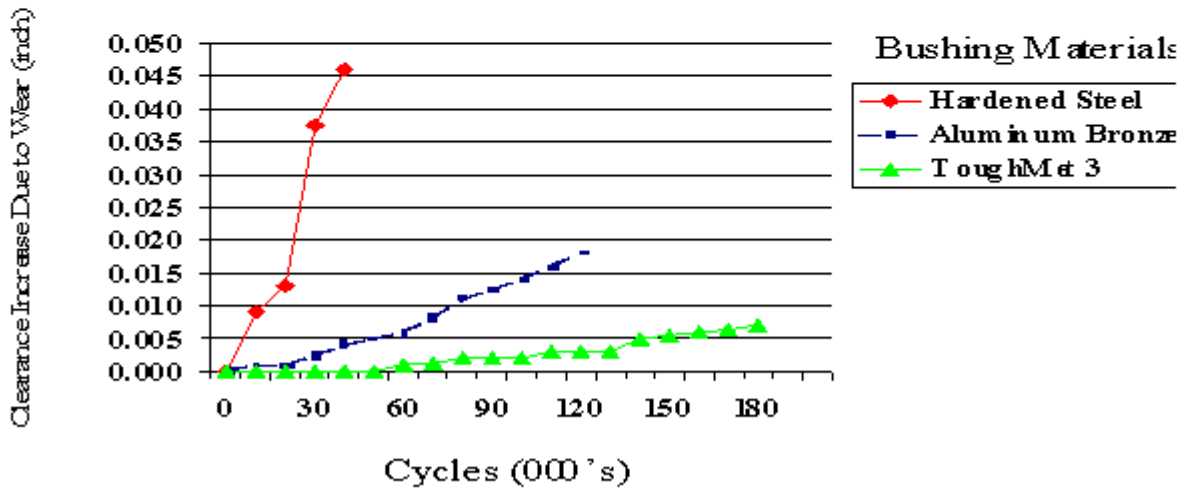
Oil Well Completion Equipment, Mining, Heavy Equipment, Hydraulic Systems, Marine Hardware, Engine Bearings.

Lorain Technology Expanding
Brush Wellman market and
application reach

BRUSHWELLMAN
Engineered Materials

ToughMet™ Industrial Components Results:

ToughMet™ Alloy Bushings and Plain Bearings Provide Superior Durability
Allowing More Time Between Machine Lubrication and Overhaul Operations.

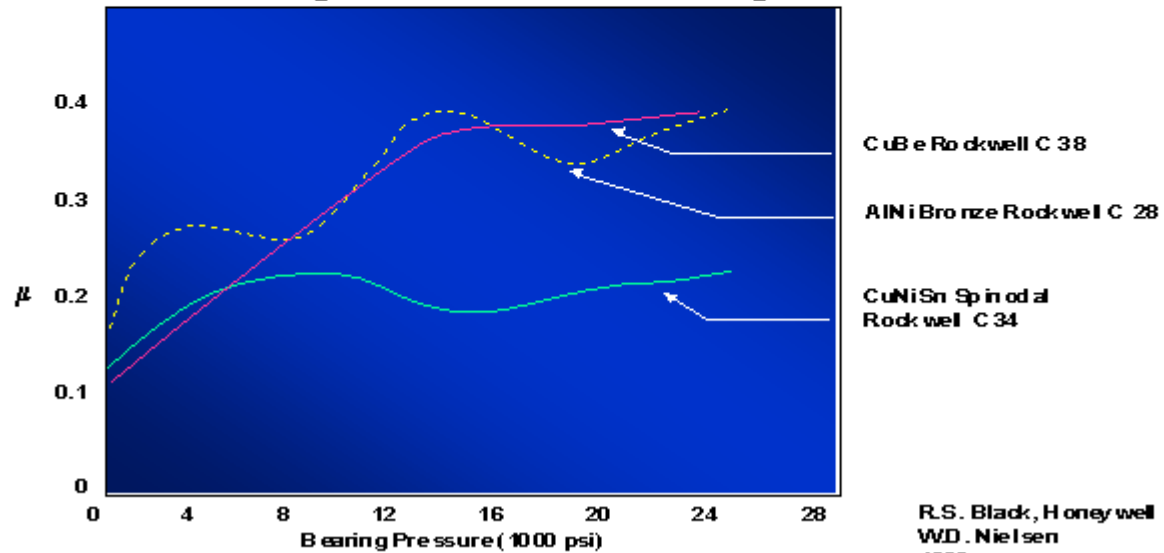


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Engineered Materials

ToughMet™ Industrial Components Results:

ToughMet™ Alloy Bushings Provide Superior Power Efficiency Performance

in a Comparison of Dynamic Coefficient of Friction μ vs
Bearing Pressure for Three Bearing Materials



R.S. Black, Honeywell
W.D. Nielsen
1996

BRUSHWELLMAN
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Alloy Progress

- Working Capital
 - Reduced 41% (\$64M) since Q-1 2001
- Expense Control
 - Manpower reduced by 35% since Q-1 2001
 - Manufacturing overhead and SG&A 29% lower in Q-2 2003 vs. Q-1 2001
- Operations Improvements since Q1 2001
 - Safety (OSHA recordable) rate improved by 70% in manufacturing
 - Rework rate improved 63%
 - On-time shipments to Service Centers 63% higher along with 44% improvement in replenishment times to the service centers

Brush International Inc.

Global Sales, Marketing, Distribution & Tech Service

Brush International Inc.

S. Freeman

◀ ----- Asia / Pacific ----- ▶

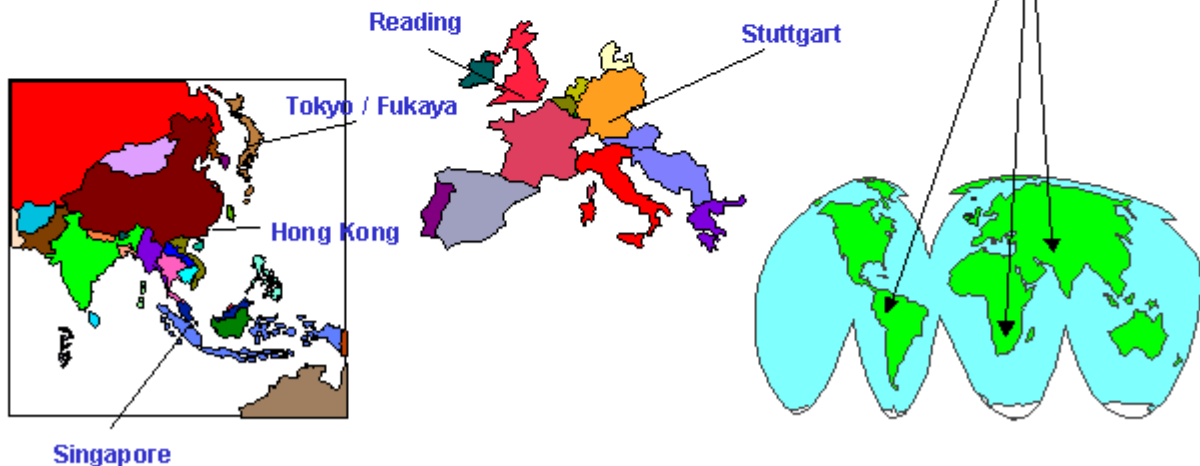
BWS	BWT	BWC	BWJ	BWK
Singapore	Taiwan	China	Japan	Korea
T. Ong	J. Tien	J. Oei	K. Hase	Y.J. Kim

◀ ----- Europe ----- ▶

BWL	BWG	BWG	BWG
U.K.	Germany	Italy	Spain
G. Shapland	K.L. Rausch	A. Danielli	F. Aguirre
	W. Zeder		

◀ - Emerging Markets - ▶

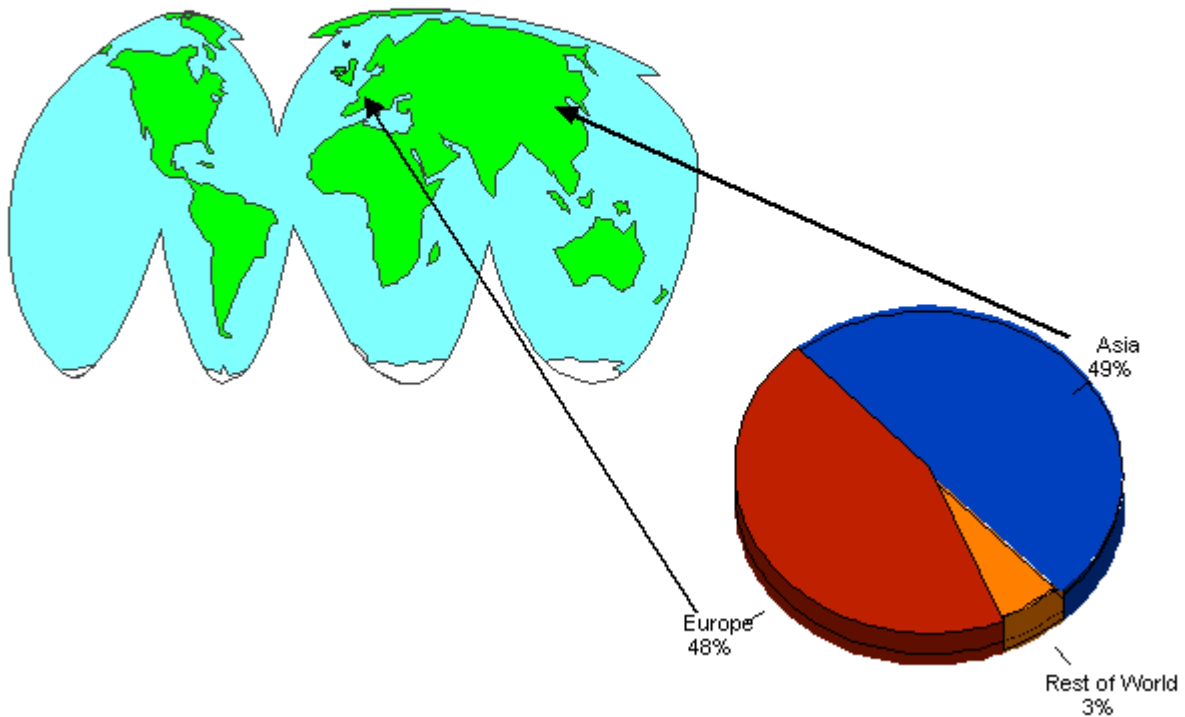
EXPORTS FROM USA



Brush International Service Centers

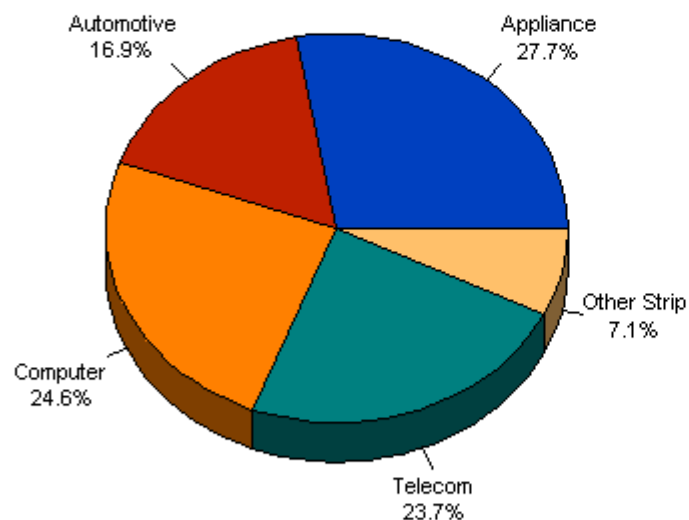
Brush International, Inc.

Alloy Sales by Region 2002

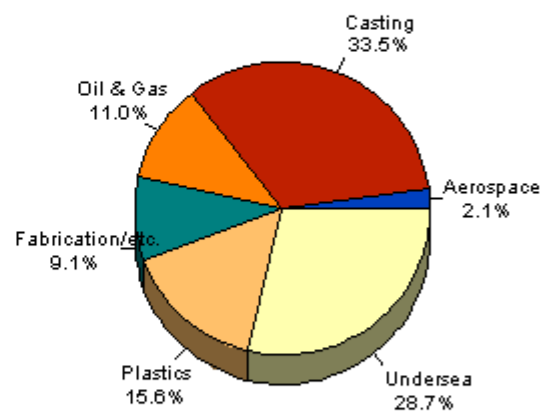


Brush International, Inc.

Historical Sales by Market Segment



Strip Products
87%



Bulk Products
13%

Brush Wellman Beryllium Products

Products

Beryllium Metal - One of the lightest metals known

- Family of vacuum hot and hot/cold isostatically pressed powder-derived metals

AlBeMet™

- Family of lightweight alloy composites
- Extruded, rolled sheet and hot isostatically pressed powder-derived metals

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Brush Wellman

Beryllium Products

Products - Cont.

- E-Materials
- Family of low expansion, lightweight electronic packaging materials
 - Composites of beryllium metal and beryllium oxide

Beryllium Oxide/

- Chemicals
- Ceramic-grade beryllium oxide powder
 - Specialty beryllium-containing chemicals

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Brush Wellman Beryllium Products

Facilities

Elmore, Ohio

Fremont, California

BRUSHWELLMAN
Engineered Materials

Key Product Attributes

- Be/AlBeMet™
 - Light Weight (Density)
 - High Stiffness (Elastic Modulus)
 - High Thermal Conductance/Capacity
 - Low Thermal Expansion
- Be
 - Transparent to X-Rays
 - Neutron Reflector

Brush Wellman Beryllium Products

Primary Competition... Alternative Materials

Organic Composites (e.g. Carbon epoxy)

Metal Matrix Composites (e.g. Al - silicon carbide)

Pyrolytic graphite

Titanium

Aluminum (high strength grades)

Major Defense/Aerospace Applications for Brush Wellman Beryllium Products

Optics

Optical substrate and support structure for visual and infrared target acquisition systems (fighter aircraft, helicopters, tanks), surveillance systems and astronomical telescopes.

Satellites

Structures and sensors for defense and commercial telecommunications satellites.

Electronics

Electronic packaging for defense avionics, radar and electronic countermeasures systems for helicopters and fighter aircraft. Applications include circuit boards, covers and packages.

BRUSHWELLMAN
Engineered Materials

Major Commercial Applications for Brush Wellman Beryllium Products

X-ray Windows

Radiographic tube components for ① medical diagnostic equipment (x-ray, mammography, CAT-scan), and ② industrial x-ray equipment

Optical Scanners

Mirrors for laser scanners used in reprographic and other high-performance laser applications.

Motion control

Structural components for high-precision semiconductor processing and industrial robotic equipment

TMI - From a Customer Perspective



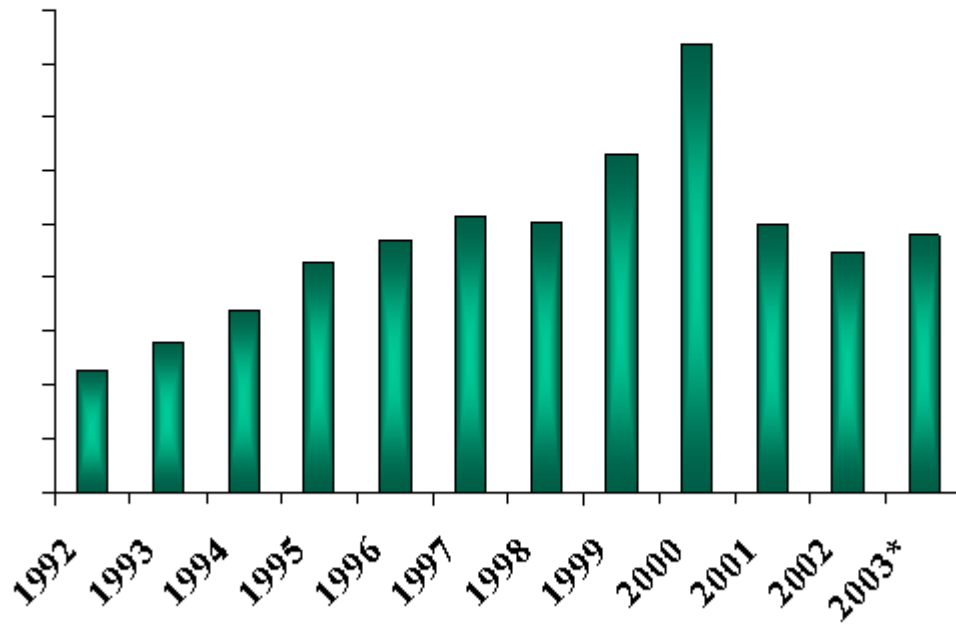
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-
- WHAT TMI provides our customers the ability to demand varied performance (electrical, thermal, or mechanical) from a metal surface area or section.
- WHO We provide this “service” to the telecommunication, automotive, computer, semiconductor and other industries.
- HOW By offering various forms of strip metal products: clad metals, plated metals, electron beam welded, solder plated, reflowed or printed-on, milled and/or skived metal strip or various combinations of the above.
-
-

Sales Growth

Average annual growth rate was 14% from 1995 - 2002



Millions

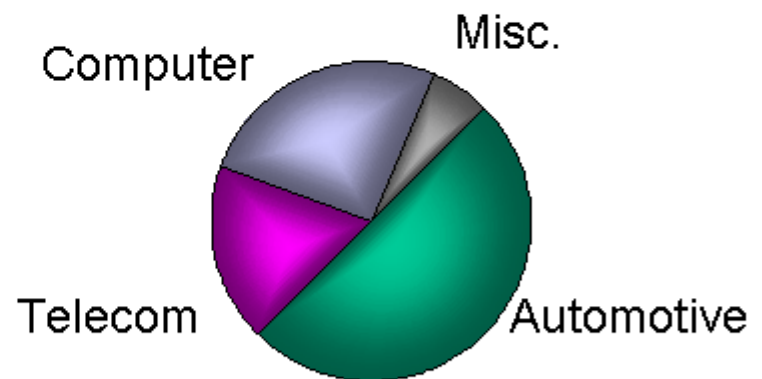


*Forecasted

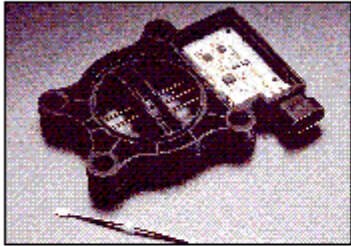
Our Major Markets



- Automotive
- Telecommunications
- Computer
- Jewelry
- Semiconductor
- Appliances
- Medical
- Aircraft



Our Major Applications

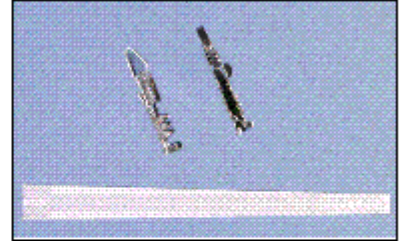


Leadframe

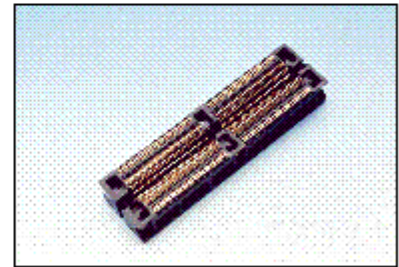


Air Bag Sensor

- Capacitors
- Coins and Tokens
- Connectors
- Contact Probes
- Fuses
- Leadframes
- Micro Motor
- Microwave
- Potentiometers
- Relays
- Sensors
- Solder Clips
- Switches



Connectors



Electroplating



- Precious and non-precious metals
 - Overall and selective stripe capabilities
 - Combination with current TMI technologies
-

Stripe Plating Application

Cellular Phone Battery Contact



Base Material

- Base Material: BeCu
- Overall Ni plating
- Selective Au (one side)
- Selective SnPb (both sides)

Competitive Advantage



-
- Quality
 - QS 9000 / ISO 9002
 - State-of-the-art equipment
 - Vision Systems / PLC Systems for consistent quality
 - Design Support
 - Technical knowledge
 - Engineering expertise
 - Overall Capabilities
 - Slitting and leveling
 - Inlay / Electron-Beam Welding / Solder / Milling / Skiving / Plating
 - Any combination of the above processes
 - Large coil handling capability
-

Strategic Concept



- Total capability under one roof
 - Make it easy for our customers to get what they need to satisfy their customers' requirements
 - Make our customers competitive with reliable products
 - Solve problems for our customers with engineered strip metal solutions
 - Explore and develop new markets and geographic regions for manufacturing (*China*).
-

Growth in Electroplating



- Precious and non-precious metals
 - Overall and selective stripe plating capabilities
 - Combination with other TMI technologies
 - Proprietary closed contact plating technology
 - Building additional lines to further increase capacity
-

Summary



- From 1992-2000 TMI sales more than quadrupled.
- 2001 and 2002 proved to be extremely difficult years due to major served markets being severely depressed; however, TMI remained profitable in both years.
- We have added major new technical capabilities using state of the art equipment in precious metal electroplating to better serve worldwide customer demand (*both technical & capacity*).
- We are ISO and QS registered.
- We will add additional Plating technology and capacity to service market demand as required.
- We are making further inroads into new markets (*energy*) and other markets (*consumer, medical, appliance, construction*) in order to broaden our served market base and will have a much different served market profile by 2004/2005.

Our focus is on materials, circuitry, subassemblies and packaging for the wireless & fiber-optic telecom market, specifically the signal amplifiers...

- Signal amplifiers transmit signals through air (wireless) or optical fiber media by boosting signal strength while maintaining integrity. Thermal management and reliability properties are of paramount importance.
- Signal amplifiers are critical active components located in base stations for wireless (cellular) and in regenerator stations along fiber-optic (Internet) links.

Our Overall Strategy

- Vertically integrate materials to subsystem assembly, providing customized solutions
- Meet the Customer's needs
 - Materials or subassemblies
- Fast Flexible Manufacturing Systems
 - Responsive to market needs

Business Groups

- Packaging
 - Electronic Packaging Products
- Circuitry
 - Circuits Processing Technology
- Materials
 - Brush Ceramic Products

Electronic Packaging Products

- Located in Newburyport, MA
- Products
 - RF Power Packages for base stations in cellular phone & wireless data networks, for cellular handsets, for military radar applications and for digital TV
 - Automotive Components for ignition systems in cars and trucks
 - Power Circuit Assemblies for DC motor controls

Circuits Processing Technology (CPT)

- Located in Oceanside, CA
- Products
 - High Frequency Military and Aerospace Circuitry used in military radar and missile guidance
 - High Frequency Wireless circuitry for satellite communications
 - Fiber Optic Package components for amplifiers in fiber optic networks



Brush Ceramic Products

- Located in Tucson, AZ
- Products
 - RF Power Package Components for cellular base stations, high definition television, and cable TV
 - Fiber Optic Package components for amplifiers in fiber optic networks
 - Gas Laser Components for medical and research applications
 - Automotive components for ignition systems

Williams Advanced Materials Overview

- Williams is a supplier of high-purity, specialty metals serving the wireless, photonics, data storage, high temperature joining, traditional microelectronics and performance film markets.
- Established 1918. Subsidiary of Brush Engineered Materials (formerly Brush Wellman Inc.)
- Business Groups
 - Packaging Material Products - Solder preforms, bonding wire, FLA's, clad material and refining. These materials are used in photonic, wireless, traditional semiconductor and hybrid microelectronic packaging applications.
 - Specialty Alloy Products - Braze materials and structural alloys. These materials are used in electron tube, photonic and aerospace applications.
 - PVD(Physical Vapor Deposition) products - Precious metal and non-precious metal sputtering and evaporation materials, refining and related services. These materials are used in wireless, photonic, thin film heads, optical media, hybrid microelectronic and performance film applications.



WAM Headquarters



- Buffalo, NY USA - Manufacturing Facility
 - 100,000 ft² overall, 6,500 ft² of cleanroom, state-of-the-art machining/ milling/rolling/stamping/ cladding centers, hydrostatic wire extrusion, high purity refining/recycling, metals casting, automated plating, full analytical capabilities, product Research & Development



Far East Operations



- Singapore - WAM Far East Pte. Ltd.
 - 5,000 ft², 2,500 ft² of cleanroom, automated assembly operations, hydrostatic wire process, product development. PVD bonding operation.



Far East Operations



- Subic Bay, Philippines
 - Combo-Lid®, low-cost lids and preform - assembly, inspection and packaging



Far East Operations



➤ Taiwan

- Joint Venture with Yuh-Cheng Metal Corp.
- Low cost production capabilities



Specialty Alloys Operations



- Wheatfield, NY USA- Williams Specialty Alloys
 - 30,000 ft² with volume vacuum casting, rolling, annealing, powder atomizing and machining. 10 acres for expansion



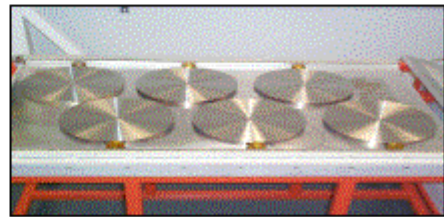
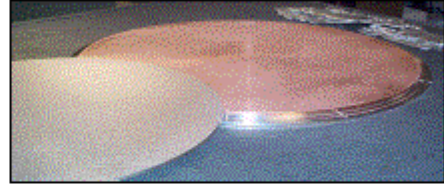
WAM Thin Film Products Operations



- Brewster, NY USA – WAM TFP
 - 35,000 ft² with vacuum melting, hot-pressing, milling, Hot & cold rolling automated machining and target bonding capabilities.
 - Acreage to more than double our facility as needed.

Target Bonding Centers

- Buffalo, NY
- Brewster, NY
- Santa Clara, CA
- Limerick, Ireland
- Singapore
- Taiwan



Williams Advanced Materials

Service and Support

➤ **Regional Offices (Sales and Applications Engineering support)**

Santa Clara, CA	Manila, Philippines
London, England	Buffalo, NY
Singapore	Boston, MA
Guadalajara, Mexico	Dallas, TX
Brewster, NY	Tucson, AZ
Taipei, Taiwan	

➤ **Worldwide Representatives**

Florida	France	Israel
Korea	India	China
Japan	Italy	Germany



Williams Advanced Materials Packaging Material Products



Hybrid Microelectronic Device

› **Markets**

Wireless, Photonics and Hybrid/
Traditional Microelectronic Devices

› **Typical End-uses**

Cell phones, LEDs, fiber-optic
networks, PC's, military
electronics, avionics, medical
electronics, appliances



Solder preforms and clad materials

› **Combo-Lids® - Frame/lid assembly**

Hermetic sealing

› **Clad Materials**

Thermal management

› **Bonding Wire**

Electronic interconnect

› **Solder Preforms**

Component attachment

› **Refining**

Scrap recovery



Williams Advanced Materials Specialty Alloy Products



Electron Tube



WAMBRAZE™ Materials

› **Markets**

Electron Tube, Photonics, Aerospace,
microelectronic packaging

› **Typical End-uses**

Cellular base stations, lasers, x-ray
machines, industrial microwaves

› **Braze materials**

Powder, ribbon and preform

› **Structural Alloys**

Monel

Cupronickel

Nickel Tungsten



Williams Advanced Materials

Physical Vapor Deposition(PVD) Products



Markets

Cellular Phone (wireless)



Products

Sputtering Targets

› **Markets**

Wireless microelectronics, Optical media, Photonics, thin film heads, glass, decorative, wear resistance, performance film

› **Typical End-uses**

Wireless and fiber optic components, Recordable CDs, DVDs, Architectural glass, Hard Disks, faucets, automotive glass

- › **Precious Metal Sputtering Targets and Evaporation Materials**
- › **Precious Metal Refining Services**
- › **Non-precious Metal Sputtering Targets and Evaporation Materials**



Williams Strategic Leverage

Ensuring Distinctive Abilities Translate to Maximum Returns

- Over 80 years of metal management and fabrication experience
 - Ability to efficiently manage precious metals critical to customers
- One-stop Shopping
 - Comprehensive product offering
 - Allows customer to reduce supplier base
- Industry leading lead times
 - Reduces Total Cost to Customer - Inventory turns
 - Alleviates planning “headaches”
- Fully Integrated Operations
 - In house fabrication, refining and analysis
 - Reduced cycle times and single point of contact for metal needs
- Service
 - WAM provides a unique, coordinated response to customers
 - We help our customers do their jobs - sales, engineering, accounting, etc.
 - We also prepare our customers for the future



Litigation

- Caseload has dropped dramatically over past two years

	<u>Total Cases Pending</u>	<u>Total Plaintiffs (including spouses)</u>
12/31/2001	76	193
12/31/2002	33	70
08/31/2003	26	60

Litigation

- Brush Wellman continues to place litigation behind it through favorable trial verdicts, settlements, and dismissal of litigation by plaintiffs
- The Company believes it has substantial defenses in remaining cases

End of Filing

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