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Dr. C. W. Jameson
National Toxicology Program
Report on Carcinogens
79 Alexander Drive
Building 4401, Room 3118
P.O. Box 12233
Research Triangle Park, NC 27709

Re: Nomination for Possible Listing in the Report on Carcinogens: Hardmetal Manufacturing

Dear Dr. Jameson:

In response to the notice published in the May 19, 2004 Federal Register, we are providing comments that specifically address the National Toxicology Program (NTP) request for current production data, use patterns, and human exposure information for "Cobalt/Tungsten-Carbide Hard Metal Manufacturing" in the U.S. The information presented in this letter and the attached report reflects Kennametal's experience over the past 66 years as the recognized leader in the U.S hardmetal industry.

Since its inception in 1938, Kennametal has been a leader in the production of cobalt/tungsten-carbide (hereafter referred to as "hardmetal") and is currently the largest producer of hardmetal and the largest consumer of tungsten for this specific application in the U.S. Based on information published in 2003 by the U.S. Geological Survey, Kennametal consumes approximately 70% of the tungsten metal that is used in the domestic production of hardmetal products. As a significant producer of hardmetal in the U.S., Kennametal has established a position of leadership and has set the standard within the domestic hardmetal industry.

Through its history, Kennametal has more than 177,000 person-years of experience in the safe production of hardmetal products with no recordable cases of occupational lung cancer among our employees. Occupational exposures to hardmetal during manufacturing operations are minimized and are controlled to low levels.

As you will see in the attached comments, hardmetal exposures do not meet NTP's criteria for being sufficiently significant for listing Cobalt/Tungsten-Carbide Hard Metal Manufacturing in the 12th edition of the Report on Carcinogens (RoC) for the following reasons:

A very small number of employees work in the hardmetal manufacturing industry. Within Kennametal's U.S. operations, approximately 1,700 people (less than 0.0006% of the U.S. population) are engaged in the manufacture of hardmetal products.

Based on Kennametal's experience, occupational exposures are controlled to low levels across the hardmetal manufacturing industry. Throughout its history, Kennametal has established and enforced proactive policies toward worker safety and product stewardship, and has aggressive programs to minimize hardmetal exposures in our manufacturing facilities.

The high intrinsic value of hardmetal results in an extremely high degree of hardmetal recovery, recycling, and reclamation throughout the life cycle of our products. The high recovery rates for this valuable product also lead to a high degree of control that limits occupational exposures, and minimizes environmental emissions of hardmetal.

There are virtually no hardmetal exposures to end users of these products, who are primarily engaged in industrial and manufacturing activities. The extreme wear resistance of hardmetal products means that very small amounts of hardmetal are needed to provide maximum benefit in product applications. This wear resistance and product applications results in no significant hardmetal exposures to end users of hardmetal products. Additionally, few hardmetal products are designed for use by U.S. consumers (i.e., non-industrial applications).

We respectfully request that NTP and the appropriate review committees consider these comments and withdraw the nomination of Cobalt/Tungsten-Carbide Hard Metal Manufacturing from consideration in the 2004-2005 RoC. If you have any questions concerning these comments, please do not hesitate to contact me.

Sincerely,

KENNAMETAL INC.

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Enclosure

Kennametal Comments on the National Toxicology Program call for public comments on current production data, use patterns, and human exposure information for Cobalt/Tungsten-Carbide Hard Metal Manufacturing in the U.S.

INTRODUCTION

In the Federal Register dated Wednesday, May 19, 2004 (69 FR:28940) the National Toxicology Program (NTP) listed 21 agents, substances, mixtures, or exposure circumstances to be reviewed in 2004-2005 for possible listing in the Report on Carcinogens (RoC), Twelfth Edition. One of these nominations was for "Cobalt/Tungsten-Carbide Hard Metal Manufacturing". Although the term hardmetal refers to a wide range of wear resistant alloys, for purposes of this report we use the term to mean cobalt/tungsten-carbide. As the leader of the U.S. hardmetal industry, Kennametal Inc. (Kennametal) is extremely knowledgeable in practices and procedures in the hardmetal industry and has prepared these comments for consideration by the NTP.

EXECUTIVE SUMMARY

As demonstrated in the balance of this report, hardmetal exposures do not meet NTP's criteria for being sufficiently "significant" for listing Cobalt/Tungsten-Carbide Hard Metal Manufacturing in the 12th edition of the RoC for the following reasons:

1. A very small number of employees work in the hardmetal manufacturing industry. Within Kennametal's U.S. operations, approximately 1,700 people (less than 0.0006% of the U.S. population) are engaged in the manufacture of hardmetal products.

2. Based on Kennametal's experience, occupational exposures are controlled to low levels across the hardmetal manufacturing industry. Throughout its history, Kennametal has established and enforced proactive policies toward worker safety and product stewardship, and has aggressive programs to minimize hardmetal exposures in our manufacturing facilities.

3. The high intrinsic value of hardmetal results in an extremely high degree of hardmetal recovery, recycling, and reclamation throughout the life cycle of our products. The high recovery rates for this valuable product also lead to a high degree of control that limits occupational exposures, and minimizes environmental emissions of hardmetal.

4. There is virtually no hardmetal exposure to end users of these products, who are primarily engaged in industrial and manufacturing activities. The extreme wear resistance of hardmetal products means that very small amounts of hardmetal are needed to provide maximum benefit in product applications. This wear resistance results in no significant exposure to hardmetal dusts or fumes by end users. Additionally, few hardmetal products are designed for use by U.S. consumers (i.e., non-industrial applications).

BACKGROUND INFORMATION

Since its inception in 1938, Kennametal has been a leader in the U.S. hardmetal industry. Over the past 66 years, Kennametal has become the largest producer of hardmetal products and is the largest U.S. consumer of tungsten for this specific application. Based on survey information developed by the U.S. Geological Survey (USGS) for 2003, Kennametal consumes approximately 70% of the tungsten metal that is used in the domestic production of hardmetal products. Kennametal has provided leadership within our industry and is familiar with the industry standards and practices.

The hardmetal industry is a highly specialized niche market, providing high value wear-resistant products that are critical to the aerospace, automotive, mining, construction, and energy industries, to name a few. However, the economic importance of hardmetal products to these industries is disproportionately high compared to the very small quantity of hardmetal that is actually used by these industries each year. An example of this is the hardmetal seat and ball check valves used in oil production. The hardmetal seats and ball check valves are minor but critical components of pumps used to extract oil from the ground. Although the amount of hardmetal used in these pumps is small, without the use of the wear resistant hardmetal components it would be virtually impossible for the pumps to produce the artificial lift required to economically extract the oil. In this manner, these specialty hardmetal components support the mulit-billion dollar per year global oil production industry.

Information developed by the USGS (2004) indicates that domestic production of all hardmetal products is on the order of 5,527 metric tons, which is very small compared to other important industrial materials. For example, domestic production of tool steel and electrical steel was approximately 460,000 metric tons in 2003. U.S. production of stainless steel in 2003 was approximately 1.9 million metric tons. Domestic aluminum production in 2003 was approximately 6.5 million metric tons. Pig iron produced in the U.S. in 2003 was more than 39 million metric tons.

Because of the high value of hardmetal products, end use applications are almost exclusively industrial operations (as discussed in more detail below) and the amount of hardmetal actually used in each application tends to be limited. For example, the hardmetal inserts used for metal cutting applications (e.g., indexable insert end mills that are used for pocketing and hole drilling applications) typically weigh from 10 grams to 15 grams each and are attached to large steel toolholders while in use in various cutting machines. Another example is the underground mining industry that relies on highly customized mining equipment to tunnel and cut though hard rock surfaces. The vast majority of these very large and highly specialized pieces of equipment are made of steel; however, the critical cutting mechanism is based on the very small hardmetal cutting tips, which are invaluable to the mining process due to their wear resistant properties.

KENNAMETAL COMMENTS

Over the past 66 years, Kennametal has accumulated more than 177,000 person-years of experience in the safe production of hardmetal-related products with no recordable cases of occupational lung cancer among its employees. Occupational exposure to hardmetal during manufacturing operations are minimized and controlled to low levels. We submit that hardmetal exposures are too low to be deemed by NTP as meeting their criteria for being significant enough for listing Cobalt/Tungsten-Carbide Hard Metal Manufacturing in the 12th edition of the RoC for the following reasons, which are explained in further detail in the following sections:

1. A very small number of employees work in the hardmetal manufacturing industry.
2. Occupational exposures are controlled to low levels across the hardmetal manufacturing industry.
3. There is an extremely high degree of hardmetal recycling and reclamation which minimizes occupational exposure and prevents significant environmental emissions of hardmetal.
4. There is virtually no hardmetal exposure to end users of hardmetal products.

1. A very small number of employees work in the hardmetal manufacturing industry.

The hardmetal industry production volumes are small compared to other U.S. industries such as the steel or aluminum alloy industries, with only 4,780 metric tons of tungsten metal being consumed in the production of cemented carbides in 2003 (USGS, 2004). This is roughly equivalent to 5,527 metric tons of hardmetal (i.e., cobalt/tungsten-carbide, assuming average cobalt content of 8 percent).

There are approximately 22 Kennametal facilities in the U.S. which utilize hardmetal in varying degrees, and within these 22 facilities, only approximately 1,700 employees have the potential for exposure to hardmetal throughout the manufacturing process. This is a very small number and represents 0.0006% of the U.S. population based on the 2000 U.S. Census. As previously discussed, hardmetal production is a small but economically significant niche industry. Given the relatively small volume of domestic production of hardmetal, estimated at 5,527 metric tons in 2003, the number of employees engaged in this industry throughout the U.S. is limited.

In addition, Kennametal's production workers are highly trained with respect to safe use and handling of hardmetal. As noted below, Kennametal has a long and established history of proactive and aggressive programs to minimize and control worker exposures.

2. Occupational exposures are controlled to low levels across the hardmetal manufacturing industry.

Kennametal has established and enforced strong proactive policies toward worker safety and product stewardship, and has aggressive programs to minimize hardmetal exposures in our hardmetal manufacturing facilities. Extensive application of engineering controls, including the redesign of

processes and process equipment, implementation of advanced material handling methods, and ventilation with high-efficiency particulate air (HEPA) filtration in air exchange systems, have long been utilized at Kennametal. As an example, powder handling processes at Kennametal use enclosed devices during the measure, transfer and transport of hardmetal powder. Beyond environmental engineering controls, the use of personal protective equipment and administrative controls are standard practice and further reduce the potential for occupational exposure.

Globally, Kennametal has implemented initiatives to drive employee exposures to levels 50-times lower than the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) exposure for cobalt. Based on our experience, similarly aggressive employee exposure controls have been implemented throughout the hardmetal industry.

Machining technology has also resulted in reduced emissions and employee exposure. The use of Computer Numerically Controlled (CNC) machines has all but eliminated machine operators' exposure to hardmetal dust. In addition, the majority of grinding of cemented carbides is performed using a wet grinding process which minimizes exposure to airborne dusts.

Likewise, subsequent hardmetal finishing processes conducted by other industrial producers of hardmetal products outside of Kennametal utilize similar manufacturing processes and controls. As a result, we would expect them to achieve the same low occupational exposure level to hardmetal in their facilities as is achieved by Kennametal.

3. There is an extremely high degree of hardmetal recycling and reclamation which minimizes occupational exposure and prevents significant environmental emissions of hardmetal.

The high intrinsic value of hardmetal has driven extraordinary levels of recycling and reclamation across the hardmetal industry. This has lead to development of tight production controls that contribute to the minimization of human exposures and process emissions. The price of hardmetal, on average, equals that of silver and for specialized hardmetal tools, the value can be double that of silver (Lassner and Schubert, 1999).

As a result, for many years, hardmetal and hardmetal constituents (i.e., tungsten carbide and cobalt) have been reclaimed and recycled from wastewater treatment sludges (from process waters), air filters, and production scrap. Hardmetal powder and machining scrap are either internally recycled or sent to external venders (typically primary producers of cobalt and tungsten metal) for reprocessing and reclamation. Based on a recent internal survey of Kennametal's hardmetal manufacturing operations, utilization and recovery of hardmetal within Kennametal's manufacturing operations is typically in excess of 99%.

For hardmetal tools used for metal cutting applications, more than 99% of the hardmetal tool remains intact at the end of its useful life. Because of the high value of hardmetal, the used hardmetal cutting tools are collected for recycle and reclamation.

This high level of reclamation has effectively diverted hardmetal from Kennametal's wastestreams (e.g. emissions to air, water, and landfill) and thereby eliminated the potential for significant human exposure from hardmetal manufacturing facility emissions.

4. There is virtually no hardmetal exposures to end users of hardmetal products.

The hardmetal industry is highly specialized, providing high value, wear-resistant products that are critical to the aerospace, automotive, mining, construction, and energy marketing segments. As previously described, the economic value of hardmetal is disproportionately high compared to the relatively small volume of product produced. As a result, applications involving hardmetal are almost exclusively industrial in nature. As discussed below, there are few consumer (i.e., non-industrial) applications for hardmetal.

Kennametal products can be generally broken into two categories: metalworking applications and impact and wear-resistant applications, as the following table describes:

Key Product Segments	Market Applications
Metalworking Applications	
Turning, threading, grooving, and cutoff tools	A wide variety of industries that cut and shape metal parts including automotive, aerospace, heavy off-road equipment, energy, medical, bearing, machine tool, and general engineering.
Inserted face and end mills	
Inserted and solid carbide drills	
Impact and Wear Resistant Tools for Non-Metalcutting Applications	
Custom cutting and drilling systems	A wide variety of industries where extremes of abrasion, corrosion, or thermal shock, mechanical shock, or compressive strength are required including underground and surface mining; trenching; road rehabilitation; quarrying; foundation drilling; water well drilling; agricultural; oil and gas exploration, production, transmission, refining and processing; and general industry including tool and die makers, steel mills, electronic stamping, etc.
Snowplow/scarifier/grader blades and wear pads	
Components for drilling bit tips, cutting structures, nozzles and hardfacing rod, American Petroleum Institute ball and seats, flow control and valve trim	
Diamond compaction tooling, hyper-compressor plungers, seal rings, slitter knives, etc.	
Matrix, thermal spray, hot press and other metallurgical powders	

Kennametal's metalworking applications provide hardmetal cutting tool materials that are designed and manufactured to withstand the high cutting forces and temperatures that normally occur in these operations. Use of hardmetal tools for metal cutting applications would not generate significant

particulate matter that would results in inhalation exposures to end users. For example, hardmetal inserts used for metal cutting applications typically weigh from 10 grams to 15 grams and are attached to large steel toolholders while in use in various cutting machines. Information developed by Kennametal's application engineers indicates that hardmetal inserts experience a loss of less than 1% of the insert weight over the life of the hardmetal tool.

In addition, the use of CNC machines and wet cutting and machining processes has all but eliminated hardmetal dust exposure. Wet grinding processes are used in those limited instances where grinding of cemented carbides is performed, which minimizes airborne dusts. However, based on Kennametal's experience, grinding of finished products is rarely conducted by end users.

Likewise, the inherent impact- and wear-resistance of hardmetal tools and products make it very unlikely that hardmetal dust will be generated during use by Kennametal's end users. For example, in a surface mining application, the Kennametal hardmetal parts were found to be 75% intact after handling five million cubic yards of highly abrasive sandstone overburden. Due to the nature of the positioning of the hardmetal-containing product in equipment used in mining, oil drilling, and road rehabilitation, the hardmetal bit tip is engaged at the drilling surface and is spatially removed from the end user. In energy applications (i.e., oil and gas well drilling) the hardmetal cutting tool is most often thousands of feet underground. Many tool parts, such as wear resistant pump fixtures and seal rings used in the energy industry, are utilized in enclosed systems and therefore do not present any potential for exposure.

It is important to note that it is not industry practice, across either the metalworking or the impact and wear-resistant tool industries, for hardmetal end users to re-shape or re-grind finished carbide parts. Typical failure of the hardmetal product is due to fractures or breakage that results in the replacement of the product. Because of the high value of hardmetal, the broken tooling or products are recycled to reclaim the hardmetal. Therefore, no exposure to hardmetal dust is expected on the part of the end user.

Lastly, it is important to note that virtually none of Kennametal's hardmetal-containing products are sold commercially to "consumers" due to the expense of such highly specialized, industrial-grade applications of these products. Only in a very few, limited applications (e.g., specialized hardmetal-tipped saw blades, ammunition reloading components) are hardmetal-containing products sold commercially. In use, these products do not generate hardmetal dust or fumes. Also, due to the extreme hardness and wear resistance of these products, it would not be common for consumers to grind the finished hardmetal product. Cutting and grinding of finished hardmetal requires specialized equipment equipped with diamond abrasives or other equally expensive and specialized cutting media. As such, the limited consumer applications of hardmetal are not expected to produce significant exposures to hardmetal during use.

CONCLUSIONS

Kennametal submits that the actual number of persons exposed to levels of hardmetal is small and is not sufficient to be deemed by NTP as meeting their criteria for listing Cobalt/Tungsten-Carbide Metal Manufacturing as significant and therefore, Cobalt/Tungsten-Carbide Metal Manufacturing should be not be listed on the RoC, Twelfth Edition. We respectfully request that NTP and the appropriate review committees consider these comments and withdraw the nomination of Cobalt/Tungsten-Carbide Hard Metal Manufacturing from consideration in the 2004-2005 RoC. This position is supported by the following:

- Hardmetal production is a small but economically significant niche industry. As the leading domestic producer of hardmetal, Kennametal has only a small number of U.S. employees (approximately 1,700 or 0.0006% of U.S. population) that are potentially exposed to hardmetal dusts. Total domestic production of all hardmetal products is estimated to be on the order of 5,527 metric tons per year.

- Based on Kennametal's experience, occupational exposure to hardmetal is very low across the hardmetal manufacturing industry due to aggressive exposure control programs, production technologies, and engineering controls which minimize hardmetal exposures in hardmetal manufacturing facilities.

- The high intrinsic value of the hardmetal raw material results in extraordinarily high recycle and reclamation of hardmetal throughout the production processes and thereby results in virtually no hardmetal being released to the environment via land, air, or wastewater disposal.

- The extreme wear- and heat-resistant properties of hardmetal results in very small amounts of hardmetal being needed to provide maximum benefit in product applications. This wear-resistance results in virtually no significant hardmetal exposures to end users of hardmetal products.

REFERENCES

Lassner, E. and W.D. Schubert. 1999. Tungsten – Properties, Chemistry, Technology of the Element, Alloys, and Chemical Compounds. New York: Kluwer Academic / Plenum Publishers.

USGS, U.S. Department of the Interior. 2004. Mineral Industry Surveys. Tungsten in December 2003. February 2004.