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## **MARKET ANALYSIS FOR NOVEL MOLYBDENUM PRODUCTS DEVELOPMENT OF “ALMALYK MMC” JSC**

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**Abstract:** This paper is accurately and broadly assessed in the report with a large focus on industry overview, product description, marketing analysis and strategies. The main attention is paid to the establishment and development of production of molybdenum sputtering target and analyzing its market by different criteria in order to succeed in selling in the highly competitive world. As part of product description, the report has provided reliable information about molybdenum uses, global sputtering target material market share by type and by application, with an exhaustive study of applications of molybdenum sputtering target. The most detailed section of the report is market analysis. It includes customer and competition analysis, target market, a SWOT analysis and the TOWS matrix. The findings indicated several suitable strategies for goal achievement as recommendations.

### **Acknowledgements**

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**Keywords:** molybdenum, molybdenum sputtering target, market analysis, a SWOT, the TOWS matrix.

### **Introduction**

According to McKinsey studies (Peterson, 2018), launching new products causes serious losses since 95% of them fail to survive more than a year. Besides, it costs six times more to launch new product than line extension. Based on these I can say that new products have less chance to succeed. Nevertheless, our organization is looking forward to expanding our business with new kind of products not only in home country, but also in the international market, too.

Many researches have been done on how to develop new product and market analysis but none of the research can meet our need properly due to several reasons such as Uzbekistan's geographical location or COVID-19 impact on global economy.

Garfors (2013) says that Uzbekistan is one of the two doubly landlocked countries which surrounded by other landlocked countries and has no access to an ocean at its borders. The World bank states that double locked countries suffer from economic constraints due to distance from major markets, higher transport costs to import and export goods, border delays, less trade.



*Figure 1. Map of Asia.*

Source: Quora.com. What are the double landlocked countries?

Moreover, “The ongoing spread of the new coronavirus has become one of the biggest threats to the global economy and financial markets” says Lee Y.N. (2020). It has been causing economic crises, huge challenges and many problems such as restrictions on export and import, a decrease in the demand and etc. This can lead to paying more attention to local production and being able to substitute imported goods and meet demand. Another main reason of developing new product is to expand product portfolio and at the same time to increase profit. The figure below shows the price comparison of molybdenum products in different forms.

*Table 1. Prices of molybdenum products.*

MoO <sub>3</sub> powder-18,53\$/kg	Mo briquette-20,18\$/kg	Mo target-2100\$/kg
<i>Source: Metal Bulletin</i>		<i>Source: alfaaeser.com</i>
		
		(for 76.2mm dia x 3.18mm thick target (410\$) used 200g Mo powder)

It is clear from the data that value added product can bring more profit.

Our organization mainly exports rare metals and products. Taking into consideration all the above mentioned situations, development of more advanced products for home country by adding them new value can play an important role to survive in global economic crisis and develop the business.

In order to properly bring our new product to the market, it is vital to have perfect strategy and plan. Peterson (2018) claimed, "A product launch will not guarantee the success of a product. A good launch cannot overcome a flawed product. However, if you've developed a competitive product that meets a need and is a solution of value and you can create a believable and gaining position in the market, then you're ready to invest in a product launch strategy and plan". The objective of this paper is to examine the ways of developing new product and demonstrate market analysis of chosen product with different marketing strategies.

### **Industry overview**

Research and Manufacturing Association for the production of rare and hard metals (former Uzbek Factory of Refractory and Heat Resistant Metals) JSC "Almalyk MMC" is manufacturer of molybdenum and tungsten products in different forms and industrial ceramic products with 70 year existence in the market. There are huge types of activities such as:

- Production of tungsten and molybdenum products in the form of oxides, powders, rods and briquettes for the alloying of iron and steel;
- Production of tungsten and molybdenum products with high added value in the form of wires of different cross sections, molybdenum round and flat rolled products, alloys of refractory metals, single crystals of tungsten, molybdenum and rhenium, obtained by powder metallurgy;
- Production of pure metals, alloys and composite powders;
- Production of carbide products and tools;
- Production of industrial ceramic products - refractory fireclay bricks, acid-resistant bricks and nozzles, locking products, ceramic muffles and tubes, aluminous cement.

The enterprise capacities allow to:

- process the cinder of the molybdenum middling products, with subsequent production of molybdenum metal by powder metallurgy, with a molybdenum content of more than 96.0%, and value-added molybdenum products (rods, plates, rods, wire);
- process tungsten concentrate with the release of tungsten metal by powder metallurgy method, with a tungsten content of more than 96.0%;
- ensure the production of tungsten carbide and carbide products.

In the era of globalization and high competitiveness, it is of utmost importance for industries to survive in rapidly developing market. In this regard, Research and Manufacturing Association is doing its best to make continuous improvements and thrive in becoming world widely-known producer of rare metals.

Its association Uzbek-Korean scientific technological center produces nanotechnology, composite and perspective materials. The goals of the scientific center are:

- carrying out applied research and new developments for the production of molybdenum and tungsten products;

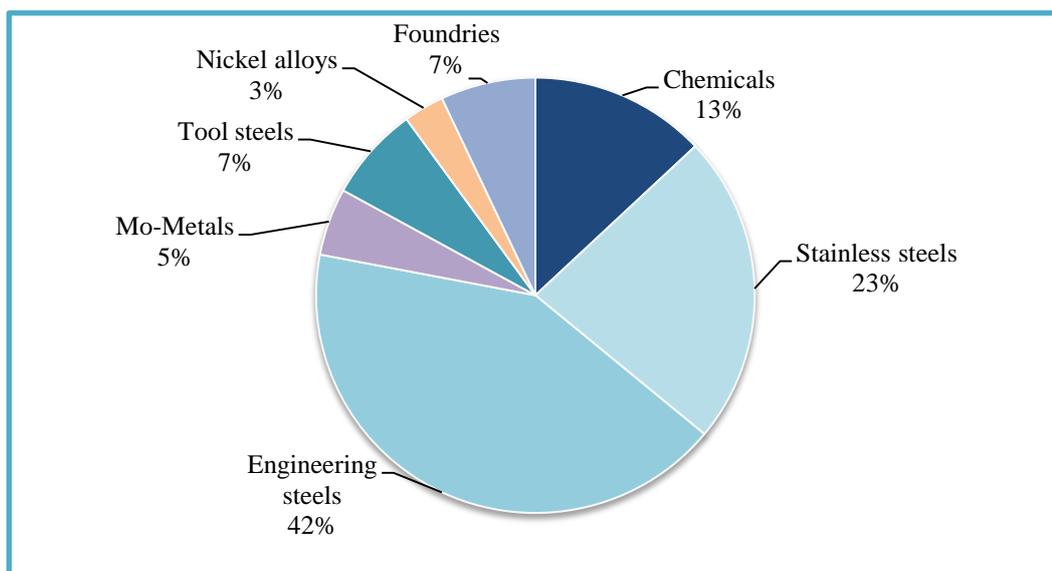
- study, introduction and industrial development of modern advanced technologies for the processing of rare metals;
- obtaining pure metals, alloys and composite powders;
- ensuring the growth of production volumes due to an increase in the load on existing production capacities;
- production of molybdenum and tungsten products with high added value by deep processing of rare metals;
- expansion of the nomenclature and increase of export potential.

In this context, the development of new materials with superior characteristics or better performance than existing materials is desirable to lead to a longer product life and therefore to reduce the cost of the product.

### **Product description**

Let us first define what molybdenum is. Pedersen (2018) states that “Molybdenum, with the atom number of 42, is a silvery-white metal that is ductile and highly resistant to corrosion, it has one of the highest melting points of all pure elements — only the elements tantalum and tungsten have higher melting points”. Molybdenum is primarily used as alloying agent in steel. The chart below shows the uses of molybdenum by percent.

*Figure 2. Uses of Molybdenum. Use 2018: 583 m lbs Mo (265,000 tonnes Mo) contained.*



*Source: Redrawn from IMO A (2018). Uses of new Molybdenum*

According to the pie chart by International Molybdenum Association, about 23% of this material is used to make molybdenum grade stainless steel, while constructional steel, tool and high speed steel and cast iron, taken together use an additional 56%. The remaining 21% is used in upgraded products including nickel alloys, molybdenum chemical compounds, lubricant grade MoS<sub>2</sub> and molybdenum metal.

Kouzegaran (2020) in his post defined “Sputtering, a technique in physics and a naturally occurring phenomenon in space, takes place when the surface of a solid material is bombarded by high-energy particles a gas or plasma with the subsequent ejection of microscopic particles”.

Figure 3. Classification of Sputtering Target Material by Product Category.

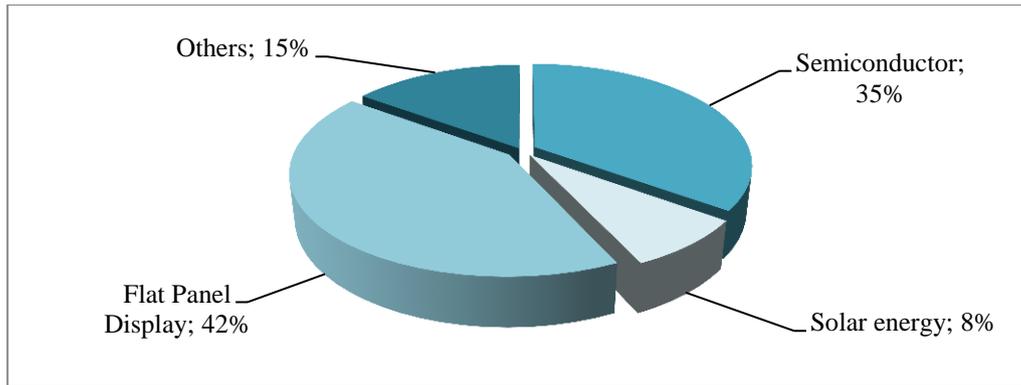


Source: Redrawn from Global Sputtering Target Material Market Research Report 2020, QY Research, 2020.

The bar chart above shows the market share by type from 2015 to 2026. It is clear from the chart that Metal Target accounted for a main share of 66% the global Sputtering Target Material market in 2015 and is expected to increase in the next few years, while the Ceramic Compound Target market share will be declined.

**Applications:** As said by Green (2019) molybdenum sputtering targets are among the major interests in semiconductor devices, electronics and IT industries with applications in memory devices LCDs, electronic devices integrated circuits and remote controls. Another main application of sputtering target is the thin-film transistors used in TFT-LCD screens and provide immediate control of the individual image dots (pixels). Apart from these, the uses of molybdenum sputtering targets on thin-film solar photovoltaic cells are also increasing with the development of new energy industry. CIGS (consists of four elements: copper (Cu), indium (In), gallium (Ga), and selenium (Se)) is an important type of solar cell used to convert sunlight into electric power. CIGS has many advantages such as strong light absorption capacity, good power generation stability, high conversion efficiency, long power generation time during the day, high power generation, low production cost and short energy recovery period. Also, according to DX Advanced Material Co., Limited, (2020), since this metal has high melting point and corrosion resistance, molybdenum sputtering target is essential with its great features in many fields such as automotive glass, optics coatings, and architectural glass.

Figure 4. Global Sputtering Target Material Market Share by Application 2019.



Source: Redrawn from *Global Sputtering Target Material Market Research Report 2020*, QY Research, 2020.

As stated by QY Research (2020), “For a long time the global sputtering target development and production mainly concentrated in the Europe, United States and Japan, and the industry concentration is quite high”.

### **Research Methodology**

In this work, research methods were specific procedures for collecting and analyzing data. Developing the research methods is an integral part of our research design to examine the ways of developing new product and why this product (molybdenum sputtering target) shall be produced in Uzbekistan and to evaluate related factors. Collected data were compared using the principle of "relative convenience". In data collection the methods: descriptive and primary methods were used to evaluate the effectiveness of the new product. Moreover, secondary data that relevant to the research was gathered. A SWOT analysis and The TOWS Matrix were applied too. The current case of developing new product and marketing strategy has been identified.

### **Marketing analysis and results**

There are a lot of marketing strategies and approaches but every organization chooses individually on what way to go. Brandt (1999) claims that market research is the key factor, since it provides critical information and direction. It identifies market needs and wants, product features, pricing, decision makers, distribution channels, motivation to buy. They're all critical to the decision process. Absence of marketing research or ignoring them can lead to failure. Therefore, first of all I have done research on the product and gone through the market situation.

### ***Why molybdenum sputtering target? (The purpose)***

With the aim of creating a new product, our center has achieved a good result in producing molybdenum sputtering target which has never been produced before not only in our organization, but also in our country. Before making this decision, some market research has been done.

Cuesta-Lopez (2017) in his report proved that molybdenum is a material which is hardly to substitute and that makes it more valuable product. From the data it can be seen that for many industries molybdenum is a vital irreplaceable with its features and producing new product from molybdenum can meet many demands.

*Figure 5. Substitutability of molybdenum by application.*

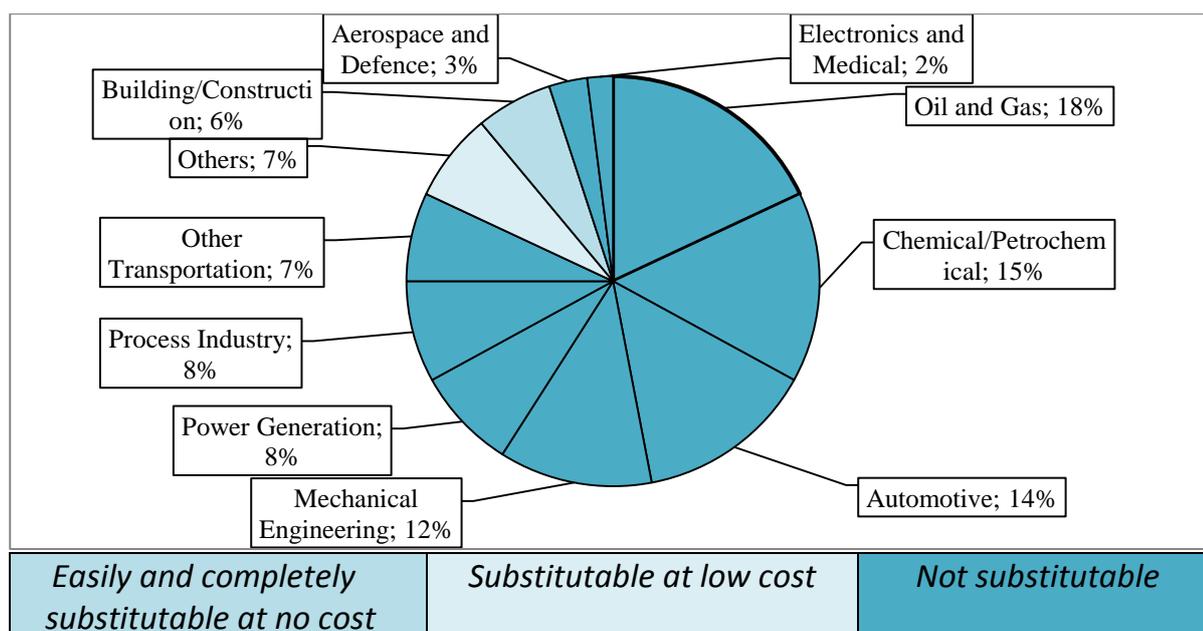


Table 2. Substitutability of molybdenum by application.

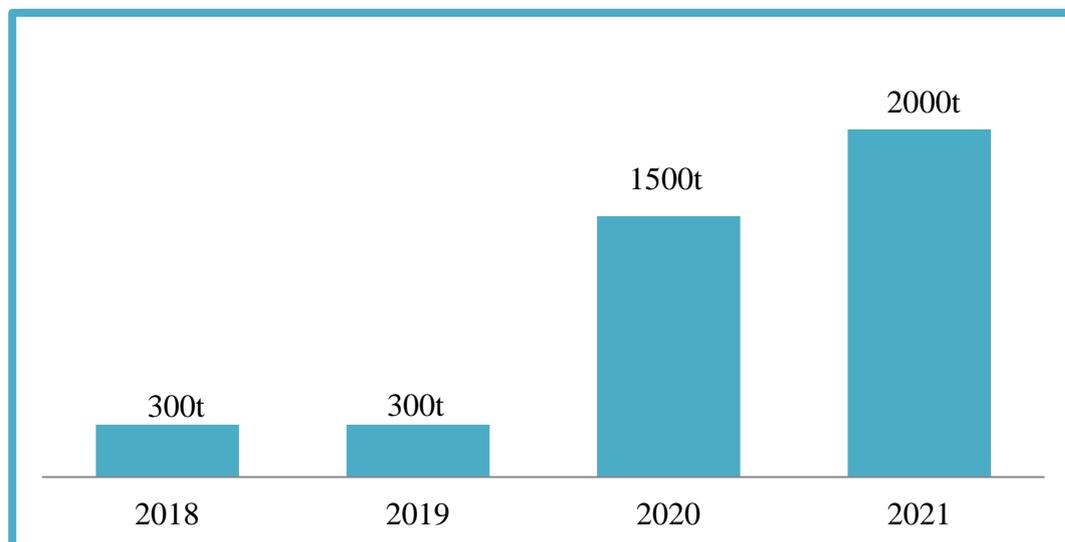
Application	Share	Megasector	Substitutability index
Oil and Gas	18%	Oil	1.0
Chemical/Petrochemical	15%	Chemicals	1.0
Automotive	14%	Transport Road	1.0
Mechanical Engineering	12%	MechEquip	1.0
Power Generation	8%	Electrical	1.0
Process Industry	8%	MechEquip	1.0
Other Transportation	7%	Transport-other	1.0
Others	7%	Other	0.5
Building/Construction	6%	Construction	0.3
Aerospace and Defence	3%	Transport-other	1.0
Electronics and Medical	2%	Electronics	1.0

Source: Redrawn from 'Report on refractory metal increase potential - substitutes nonrefractory metals,' (Cuesta-Lopez, 2017).

Market studies show that molybdenum sputtering target is one of the most demandable and modern products with many applications and advantages. Moreover, since it is not just ordinary product which requires difficult production processes, raw

materials and technologies, there are customers both in local and foreign market which described in detail below. Furthermore, as Uzbekistan is in the top ten countries in terms of molybdenum and tungsten reserves, our new technologies and capacities let remove entering barriers.

*Figure 6. Predicted growth in reserves of the molybdenum and other rare-earth metals, t/year.*



*Source: Redrawn from “Metals and Mining Industry”, Development Strategy Framework of the Republic of Uzbekistan by 2035 (2019).*

According to Development Strategy Framework of the Republic of Uzbekistan by 2035 (2019), by 2021 Uzbekistan will be able to increase molybdenum production by about seven times (2000 tons), in comparison with 2019 (300 tons), which can suggest that the industry is promising.

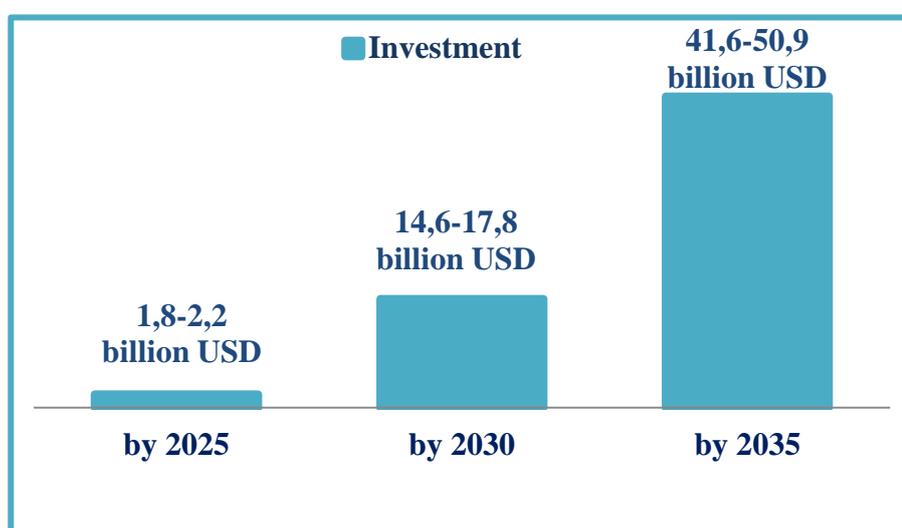
Due to Mo sputtering target’s remarkable properties, such as high thermal stability at elevated temperatures, good adhesion property, remarkable electrical conductivity and high reflectivity, Mo has been widely used as a back contact layer, especially in chalcopyrite (CuInGaSe<sub>2</sub>)-based thin film solar cells. Solar energy is free, harmless and unlimited source of the environment. 10% of the electricity generated worldwide comes from solar energy. Solar energy is evolving because of the growing interest in the use of renewable energy sources. The solar potential in Uzbekistan is twice as high as in Europe. Uzbekistan is also paying high attention to developing and increasing the use of solar photovoltaic energy and plans to build about 25 solar power plants by 2030. This was announced by Deputy Minister of Energy of Uzbekistan Sherzod Khojayev (2019). However in Central Asia this sector is not well established since technology is very expensive and complicated. Among the possible coating options for solar cells, several experimental results point out that molybdenum coatings are optimal and there is a high demand.

In order to develop local production and substitute export products, we can cooperate with and supply enterprises such as “ARTEL” and “UZAVTOSANOAT” JSC. Artel is a leader in the production of household appliances and electronics in Central Asia and cooperates with world’s famous companies such as “Samsung” and “Shivaki”. At the

moment, “Artel” manufactures Samsung refrigerators, monitors, televisions and vacuum cleaners, as well as a line of Shivaki household appliances.

The main and only Industrial auto manufacturer in Uzbekistan is “UZAVTOSANOAT” JSC which has 85 enterprises such as “GM Uzbekistan” JSC, “SamAvto” LLC, “JV MAN Auto – Uzbekistan” JV LLC, “GM Powertrain Uzbekistan” CSC. The government is paying high attention to the auto industry, which can be proved by below shown tables. According to development strategy, year by year there is noticeable increase of investment on this industry and by 2035 it is planning to create approximately twice as many jobs (50,000 employees). Moreover, considering existing production capacities, Uzbekistan has the potential to manufacture and sell up to 400,000 vehicles annually by 2035 (Development Strategy Framework of the Republic of Uzbekistan by 2035, 2019).

**Figure 7. Investment on automotive industry in billion USD, 2025-2035.**



Source: Redrawn from “Automotive Industry”, Development Strategy Framework of the Republic of Uzbekistan by 2035 (2019).

**Table 3. Automotive industry figures**

Figures		
Year	2018	2035
Creation of jobs, '000 employees	27	50
Share of electric vehicles, %	0	30
Car manufacturing volume, 1000 units	225	400

Source: Redrawn from “Automotive Industry”, Development Strategy Framework of the Republic of Uzbekistan by 2035 (2019).

Based on these, we can say that molybdenum sputtering target is a good which can be used in variety spheres and is one of the demandable products for many businesses. The main goal is to capture Uzbek market with a new product and to reach the maturity

phase of product growth cycle both at home country and abroad. Let's go through each analysis phase:

**Customer analysis:** In this regard it is highly advisable to do customer analysis; it is one of the most important parts of any startup strategy. It can actually help reduce risk because if we really understand our potential customers and market conditions, we'll have a better chance of developing a viable product.

Demographic criteria such as age, gender, religion, marital status does not play an important role because our customers are enterprises, not people. Our potential customer could be businesses and retailers.

**Target market:** In the beginning our target customer strategy is undifferentiated offering means "Offer the same product to the entire market" in Uzbekistan. Our main target is highly concentrated on solar industries, auto industry, electronic companies and laboratories account for large percentage of the total market. Usually, local companies which use or buy this product export from foreign firms since there are not any competitors who can sell or produce molybdenum sputtering target in our country. Therefore, our first aim is to supply all local markets in order to minimize export and increase localization which is approved by governmental policy. At the second stage, we are intending to export world widely by improving product features and customizing according to clients' request so that our organization and products can be competitive and demandable.

**Competition:** In order to study marketing environment, it would not be complete without competitor analysis. There are giant and popular companies with loyal clients. The vendors in the market are competing against each other (operation cost, price, economies of scale, product quality, and innovation). The world market is dominated by China, Chile and the USA and it may affect as a threat to a new product. Major competitors of sputtering target are Plansee, Elmet technologies, H.C. Starck, Jinduicheng Molybdenum Group.

Plansee is Austrian company that specializes in the powder metallurgical production of materials (molybdenum and tungsten) and in processing them into tools and molded parts.

Elmet Technologies is a global leader in high-performance tungsten and molybdenum refractory metal product manufacturing and machining services.

H.C. Starck is a leading premium supplier of the technology metals tungsten, molybdenum, tantalum and niobium and high-performance ceramics.

Jinduicheng Molybdenum Group Co., Ltd. manufactures and distributes molybdenum products. The company produces molybdenum charge products, molybdenum chemicals, molybdenum metal materials, and other products.

In Uzbek market the metal is lowly competitive that we can see it as an opportunity. Without any doubt I can say that there are not any producers of this product and only some suppliers in Uzbekistan. Buying molybdenum sputtering target can be established either through distributors who cooperate with Russian company "BVB-Alyans" or alibaba.com where Chinese suppliers such as KOBO materials Co., Ltd. Baoji Hanz Metal Material Co., Ltd. Shenzhen Zhenxing Communication Shares Co., Ltd. Zhengzhou Shibo

Nonferrous Metals Products Co., Ltd., Luoyang Tuoqing Refractory Metal Co., Ltd. and etc. are offering their products.

**SWOT analysis**

Any new business or product should apply a SWOT analysis. Conducting the SWOT analysis is a powerful way to evaluate our product, the SWOT exercise yields to improve our internal processes and workflows. Let’s look at the SWOT analysis of molybdenum sputtering target.

Table 4. SWOT analysis.

		POSITIVE FACTORS	NEGATIVE FACTORS
<b>INTERNAL</b>		<p><b><u>STRENGTHS</u></b></p> <ul style="list-style-type: none"> <li>• Low labor cost because</li> <li>• Low energy cost</li> <li>• Low natural resources cost</li> <li>• Own raw materials</li> <li>• Full-cycle production process from mining-hydrometallurgy and sintering</li> </ul>	<p><b><u>WEAKNESSES</u></b></p> <ul style="list-style-type: none"> <li>• Obsolete old equipment</li> <li>• Low quality raw materials</li> <li>• Poor marketing positioning (no proper websites about company’s activities, products and opportunities)</li> <li>• Reliability and trust, brand perception (what customers believe about product)</li> <li>• Poor customer service comparing to competitors</li> <li>• Unable to capture high income group</li> <li>• Less experts with necessary knowledge to meet competitive market demand (some barriers: language, production skills, experience, awareness of latest innovations).</li> </ul>
		<p><b><u>OPPORTUNITIES</u></b></p> <ul style="list-style-type: none"> <li>• Almost no competitors in Uzbek market</li> <li>• Rise in demand in molybdenum market</li> </ul>	<p><b><u>THREATS</u></b></p> <ul style="list-style-type: none"> <li>• Large number of competitors worldwide</li> <li>• Giant and well-known brands with loyal customers</li> </ul>
<b>EXTERNAL</b>			

**The TOWS Matrix**

As it is written in Business-to-you.com (2017) a SWOT analysis helps assessing a company’s current internal and external situation, but does not provide concrete strategic

actions to take. One way to map out the strategic options for a company is by using the so called TOWS matrix. By combining the external environment's opportunities and threats with the internal organization's strengths and weaknesses, management can come up with four basic strategies to follow based on the situation. Shortly, this matrix helps overcome weaknesses and threats by using strengths and opportunities.

*Strengths/Opportunities-(SO)*

- Capture all local markets to reduce import
- Must enter exporting to earn foreign currency
- Create innovation in products and increase product line

*Strengths/Threats--(SO)*

- Improve online buying presence for convenient purchase

*Weaknesses/Opportunities-(WO)*

- Provide training to achieve efficient workforce
- Create official sites to increase brand awareness

*Weaknesses/Threats-(WT)*

- Involve in activation programs and exhibitions.

## **Recommendations**

**Potential strategies for growth:** Based on SWOT and TOWS, it can be summed up that in order to carry out new product manufacturing, some strategic plans are required.

### **1. Updating equipment**

One of the main initiatives to further development is creating a Consortium for modernizing equipment and maintaining of new production facilities. The Consortium must contain investment companies, mining companies such as Almalyk mining and Navoi mining and other relative companies including foreign ones. In this case mining, refinery, production and investment will be secured on one company creating win-win situations for all companies.

### **2. Market segmentation**

One of the big threats is well-known competitors. Choosing proper target segment is rational way of overcoming threats. Molybdenum products have large list of applications and meeting demand of all sectors is difficult. Choosing market niche by satisfying specific market needs can help be able to meet the demand of the exact customers with exact requirements and at the same time to survive in highly competitive world.

### **3. Advancing web-sites**

In the era of rapid Internet development, many buyers prefer online shopping. Building and improving online presence is a powerful marketing tool since it makes one click connection with customers. Company's Web-site should provide full information about company and its products and services with perfect and attractive design to educate customers, improve advertising effectiveness and productivity, expand market. (Ecotone Digital Solutions, 2020).

#### **4. Employee training**

Employee training is another main factor which has great influence on development. With the help of the training program, employee can get necessary skill and higher level which leads to achieve goals faster and more efficiently.

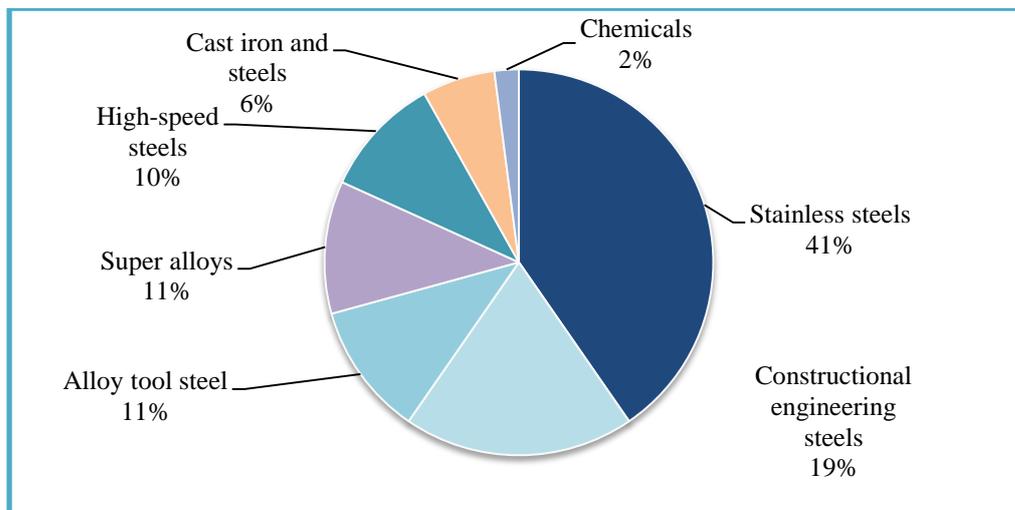
#### **5. Participation in different programs**

Participating in many exhibitions and activations programs give opportunity to introduce the product to customers in close and increase brand awareness among them. It is necessary to acquaint the customers with the product, give them more information about its use and benefits.

#### **6. Recycling used material**

As IMOA states (2018), molybdenum comes from two sources: mining and recycling and fully recyclability is one of the main advantages of molybdenum since it requires less energy than the production of primary metal. The pie chart below shows that 60% of scrap is used in stainless steels and constructional engineering steels, the rest is used in the production of alloy tool steels, super alloys, cast irons and chemicals.

**Figure 8. The proportion of molybdenum scrap varies by product segments.**



Source: Redrawn from IMOA (2018). Molybdenum scrap saves resources

Therefore, advancing the use of recycling is rational and profitable way in this field.

#### **7. From B2B to B2C**

Our organization markets B2B (Business to Business), not to final customers. Establishment of B2C (Business-to-consumer) strategy which is directly works with final customers could be a huge marketing asset to improve brand recognition and profit. Developing B2C allows the organization to know and understand better customers' needs by increasing awareness and better interactions.

## Conclusion

This study investigated producing molybdenum sputtering target by analyzing market and provided several strategies to achieve established task. Providing new product to our segment of world market like Industrial products such as glass industry, solar cells, auto industry can be a new business in competitive marketing condition. To sum up with this study that it is possible to develop Mo sputtering target by implementation marketing strategies mentioned in the study and make a prosperous vision.

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