

Tungsten in 2017

EndUse Consumption

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1. Tungsten in 2017/18 at a Glance

On the economic front 2017 and 2018 were upswing years. Healthy growth could be seen in virtually all global countries and regions. Increasing investments accelerated the pace of global trade. Metal and fuel prices were climbing due to an increase in global demand. The global GDP rose by 3.7 %.

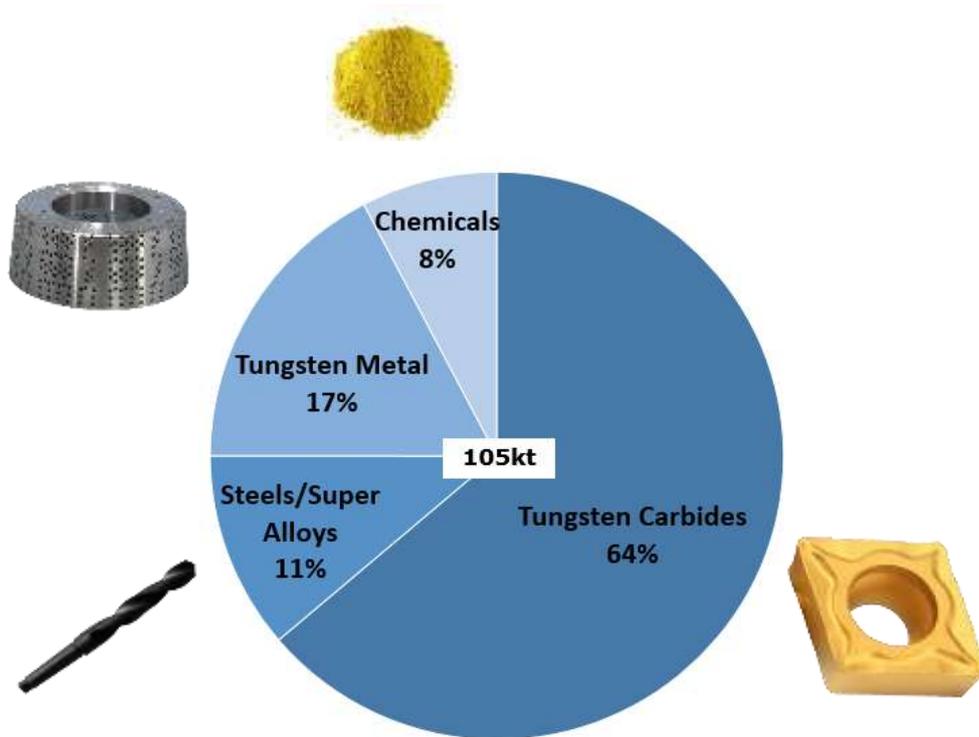
The recovery of the world economy in 2017 resulted in a total real end-use demand of tungsten for end use applications of **105 kt**. Thus, it was a very good year for tungsten as the real market growth (7.7%) was significantly higher than the average estimated long term growth of 2.4%. And, without having final figures yet, the above average growth continued in 2018, although at a slower pace.

Mega-Trends, resulting from our 2017 investigation, and their implications for the Tungsten market.

- + Displacement of the growth focus from Europe and America to Asia.
 - o A considerable part of today's tungsten business will be transferred to Asia.
- + Displacement of population growth to emerging countries, aging population in developed countries and a severe lack of workforce in developed countries.
 - o Growth of segments primarily driven by population and wealth growth (Consumer Durables, Energy, Transport) will take place only in emerging markets.
- + Urbanisation is advancing rapidly.
 - o Urbanisation will drive the growth of segments like Construction, Railways, Consumer Durables and Energy push the need of tungsten products in these segments.

- Progress in technology and digitalisation is supporting global productivity and integration.
 - o Products and production methods will constantly be improved which will have a negative effect on the volume of tungsten needed.
- Climate change and lack of resources are reasons for disputes and will create considerable influence on traditional industries.
 - o Decarbonisation will create major changes in the segments Transport and Energy. The move to E-mobility and renewable energies represents a threat to the tungsten consumption.
 - o The increase in some sub-segments e.g. wind energy cannot compensate the overall loss to the tungsten market.

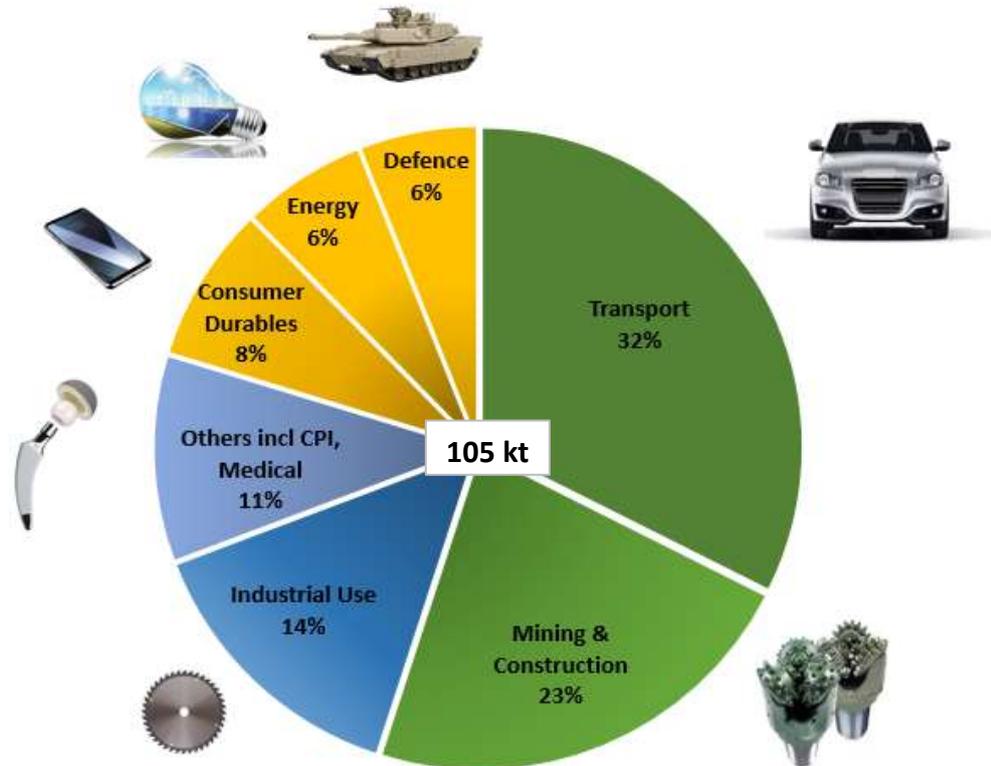
2. FirstUse Segments in 2017



Source: ITIA & SMR

The dominating segment, Tungsten Carbide, stays unchanged since many years at around 65% of the W market. The three remaining segments are more volatile in their share of the market.

3. EndUse Segments in 2017



Source: SMR

- Green segments have been investigated in 2016/17
- Yellow segments are actually investigated in 2017/18
- Blue segments are due in 2018/19, thus they are estimates

Estimates for all EndUse segments have been derived from the total FirstUse figures based on ITIA production reports. The size of the investigated segments changed substantially in 2017 compared to previous estimates as the in depth market analysis resulted in a better segment knowledge.

4. EndUse Segments in 2017

4.1 Mining & Construction

Mining & Construction represented 23,700 t in 2017.

Sub-Segments:

- Surface Mining
- Underground Mining
- Road Milling
- Tunnelling
- Geothermal & Water Well drilling
- Trenching
- Quarrying & Crushing
- Construction Machinery
- Others (Mixer, Grader, snow plough)

Mining:

- 'The mining miracle in 2017': increasing commodity prices are pushing confidence and leading to new exploration projects, expanding existing mines and replacement, resulting in a 6.5% turnover growth for the entire global mining industry.
- In respect of Tungsten consumption, the Mining Segment grew by 21%.
- The majority of growth was caused by stock replenishment, which has not been repeated this year, as commodity prices started to decline in summer 2018.

Construction:

- Only 1.4% growth of the construction sector in 2017, since some global regions where even negative.
- Nevertheless the Tungsten consumption in the Construction Segment grew by an astonishing 12% as repairs dominated (over new build roads) which are main drivers for Tungsten carbide demand.

4.2 Transport in 2017

The Transport Segment represented 34,200 t in 2017, growing by 1.9% based on the following sub-segment drivers.

Sub-Segments:

- Passenger Cars
- Trucks and Busses
- Civil / General Aviation
- Other Transportation

Automotive/Trucks & Busses

- Growth of automotive light vehicles +1.8% global in 2017 to 92.8 Mio units, this is expected to grow by 2.1% to 94.7 Mio units in 2018.
- Total numbers of electric vehicles sold in 2017: 1.2 Mio. 66 % Battery electric vehicles, 34 % plug in hybrid electric vehicles. Although the absolute numbers are still small, the growth rates are significant. In 2018 a growth of almost 100% is expected, to over 2 million units.
- Significant growth for Trucks of +18%
- Decline in Busses of -6.5%

Civil / General Aviation:

- +7.5% more passengers in air travel, 4.5% cargo growth.
- Roll-out has grown only by 1.5% up to 1,740 commercial aircrafts.
- This discrepancy indicates stronger aircraft manufacturing in the years ahead, driving the Tungsten Carbide demand.

Other Transportation:

Trains/Railways:

- The global railway market is healthy. Spending has increased in 2017 by 3.7%.
- Investments in high speed tracks (switches) and rolling stocks are the main drivers for Tungsten consumption.

Shipbuilding:

- Shipbuilding is still suffering from overcapacity. The orderbook 2017 stagnated at a historically very low level around 80 million CGT (Compensated Gross Tonnage), but the market has bottomed out and is expected to grow.

Farming Machinery:

- The global farming machinery market returned to growth in 2017.
- 'Robo farming' with autonomous tractors was gaining importance in 2017.

4.3 Energy in 2017

Energy represented 6,650 tonnes of Tungsten Consumption.

Sub-Segments:

- Oil and Gas
- Thermal Power Generation
- Renewable Energy
- Distribution

The by far dominating consuming segment of W and main driver of growth was the recovering Oil & Gas business.

- Oil & Gas price has recovered in 2017 (from <40 to 70 \$/barrel)
- Active rigs increased substantially from 1600 in 2016 to 2258 in Q3/2018, up by over 40% but still far below 2008 (3,336). At the moment the rig count is rather stagnating.
- Steam & Gas turbine business in 2017 was down by ~50% and stagnates in 2018.
- 522 coal fired power plants closed between 2015-2017. A 28% drop in newly completed coal plants and a 29% drop in construction starts in 2017. For the future no recovery is expected.
- Nuclear power stations 2017: 59 under construction, 4 connected to the grid and we expect it to remain stable in 2018.
- Renewable power is transforming the global electricity system, with new capacity and investment values consistently outstripping performance in the fossil-fuel sector. In 2017, more than 160 gigawatts of solar, wind, hydropower, geothermal, and biomass capacity was built around the world.

- Around one fifth of the world energy came from renewables in 2017. They made up more than half of new additions to power generation capacity globally. Although wind power is a heavy W consuming segment, it does not compensate the loss relative to fossil powered plants. Thus, the strong trend towards renewables is a growth inhibitor for Tungsten.

4.4 Consumer Durables in 2017

Consumer Durables represented 8,400 tonnes of Tungsten consumption.

Sub-Segments:

- General Applications
 - Consumer Electronics
 - Jewelleries
 - Leisure Equipment
 - Power- and Hand Tools
 - Home Furnishing
-
- Growing middle class, wealth (GDP / capita) and growing population in emerging countries in general as major driver.
 - Global GDP/Capita Growth (PPP) 2017: 3.7%.
 - Tungsten consumption concentrated in Asia.
 - Digitalisation on the strong rise as the world gets more connected. This requires more printed circuit boards.
 - New design principles in smart phones require more machining.
 - Shortening product life cycles boosts the tooling consumption.
 - 'Do it yourself' still growing (Power tools and drills).
 - E-Bikes require a surprisingly high amount of wear parts and cutting tools.

4.5 Defence in 2017

Defence represented 6,300 tonnes of Tungsten consumption.

Sub-Segments:

- Ammunition
 - Ordnance Equipment
-
- Global defence budgets were growing 3% in 2017 and projected to grow 3.3% in 2018 but growth rates for W are not related to the military spending.

- Growing usage of armour piercing ammunition requires more heavy metals.
- Armor piercing ammunition contains an increasing amount of W and WC projectiles.
- Possible long term driver might be the substitution of depleted uranium ammunition through Tungsten.
- But the importance of tank based battles is declining.
- The 2% target (of GDP), set by NATO, will drive the manufacturing of ordnance equipment. This ensures that Tungsten Carbide cutting tools demand continues to grow in the Defence segment.

4.6 Others (Industrial Use and Chemicals)

The two categories classified as 'Others' represented 26,000 tonnes of Tungsten consumption in 2017.

Sub-Segments:

- Tooling/Forming
- Other Industrial Use (Food Processing, Mechanical Engineering, etc)
- Pumps
- Coatings
- Welding
- Other Industrial uses
- Chemical / Petrochemical
- Medical & Pharmaceutical
- Others

Only estimates are available now. A detailed analysis will be carried out in 2019.