COBALT: A HISTORY OF SUCCESS WITH HARD METALS

Cobalt, key component to the hardmetal industry

- Cobalt is an essential technology enabling metal, a critical material where energy storage, high temperature resilience, hardness, process efficiency and environmental benefits are required.
- Cobalt has a wide range of industrial uses from gas turbines and hard metals to rechargeable batteries and industrial catalysts, which are vital in the development of sustainable energy policies for the future.
- Cobalt brings numerous advantages to the hardmetal industry where hard wearing metals and alloys allow the manufacturer to produce highly effective cutting and grinding tools, suitable for a broad range of industrial and manufacturing applications.
Cemented carbides, also known as hardmetals, are a particular group of alloys entailing a broad range of composite materials which consist of hard carbide particles bonded together by a metallic binder such as cobalt.

Highlight: One of the key uses of cobalt metal is as a binder for tungsten carbide (WC).

Cobalt has a very high melting point at 1493°C.
Cobalt has a high temperature strength.
Cobalt forms a liquid phase with WC at 1275°C, pulling sintered parts together, and eliminating voids.

Its unique wettability with WC allows liquid cobalt to flow easily between the carbide grains, helping achieve full density. Upon cooling, WC re-precipitates in the bond conferring hardness and toughness.

Cobalt can be ground to a very fine powder giving rise to a brittle, close packed form.
The fine powder can be easily mixed with hard carbide particles, reverting to a ductile cubic form at room temperature.
The addition of cobalt to the carbide allows for increased resistance to wear, hardness and toughness, essential qualities for cutting tools, drills, diggers' (tines) metal rollers and other engineered products, particularly for manufacturing.

Hardmetals are used in a wide range of industries, such as:

- Automotive
- Aerospace
- Energy
- Mining
- Engineering
Hardmetals are manufactured by a powder metallurgy process. The carbide powders are blended with very fine cobalt metal powder, compacted and sintered at high temperature (1300° to 1500°C) to create a dense, hard product.

When manufacturing cemented carbides, it is fundamental to take into account its end use:

- Wood working tools do not require maximum hardness due to the relative soft wood, therefore, they contain a relatively lower amount of cobalt
- Rolls for hot rolling of metals require a high level of hardness and thus have a higher cobalt content

Increasing the cobalt content and tungsten carbide grain size confers a greater degree of hardness to the cemented carbide

Cobalt contained in cemented carbides is largely recycled, thus hardmetals perform a sustainable role in the circular economic model