White Paper on Resilience in Tooling Industry
Alternative Tool Materials to Cemented Carbide -
Ultra-Hard High-Speed Steels Enabled by AM-HSS™

Author: VBN Components AB

Material Platform: Vibenite® 290 and other Vibenite grades

Process Technology: AM-HSS™ (Additive Manufacturing of High-Speed Steels)

Executive Summary

The European tooling industry is facing increasing volatility in tungsten carbide pricing due to structural supply concentration, geopolitical exposure, and classification of tungsten as a critical raw material. Cemented carbide has long been the dominant material for wear-intensive tooling applications, but its cost structure and supply risks are prompting the industry to explore alternative high-performance materials.

This white paper presents ultra-hard, carbide-rich high-speed steels produced through the proprietary AM-HSS process as a technically viable and strategically attractive complement to cemented carbide. In particular, Vibenite 290 demonstrates hardness levels up to 76 HRC combined with usable toughness and high wear resistance.

The objective is not to replace tungsten carbide in all applications, but to introduce a new material class that expands design freedom while reducing exposure to critical raw materials.

1. Background: Structural Challenges of Cemented Carbide

Cemented carbide consists primarily of tungsten carbide (WC) particles bonded by a cobalt matrix.

Key strengths include:

- Extremely high hardness
- Excellent compressive strength
- Superior abrasion resistance
- Thermal stability at cutting temperatures

Emerging challenges include raw material volatility, cost sensitivity, design limitations, and increasing sustainability requirements.

2. AM-HSS – Additive Manufacturing of High-Speed Steels

AM-HSS is a proprietary additive manufacturing platform enabling extremely high alloying levels, controlled microstructures, high carbide volume fractions, and near-net-shape production.

Key technical characteristics:

- Homogeneous carbide distribution

- Fine and uniform microstructure
- Possibility for graded structures
- Controlled porosity and density

Our process route includes state-of-the-art use of advanced heat treatment. HPHT™, short for High Pressure Heat Treatment, includes capabilities for integrating different heat treatment strategies within the HIP process. Uniform Rapid Quenching, URQ®, enables high speed quenching of the payload.[1]

3. Vibenite 290 – Material Overview

Vibenite 290 is an ultra-high alloyed tool steel designed for extreme wear applications.

Key properties:

- Hardness up to 76 HRC
- High carbide content
- Good compressive strength
- Useful fracture toughness
- Iron-based matrix

4. Performance Positioning vs Cemented Carbide

Property	Cemented Carbide	Vibenite 290
Hardness	Extremely high	Very high (up to 76 HRC)
Fracture toughness	Low–moderate	Moderate
Wear resistance	Excellent	Excellent
Raw material exposure	High (W, Co)	Reduced dependency
Manufacturing flexibility	Limited	High (Additive Manufacturing)

5. Application Areas

Potential applications include:

- Cutting tools
- Forming tools
- Cold work tooling
- Wear plates and inserts
- Woodworking tools
- Plastic processing components
- Powder compaction tooling
- Shear blades

[1] HPHT and URQ are trademarks of Quintus Technologies

6. Design and Manufacturing Advantages

Additive manufacturing enables geometric freedom including internal cooling channels, lattice structures, and material grading. Material tailoring allows property customization and local hardness variations.

Iron-based ultra-hard steels reduce dependency on tungsten and cobalt.

7. Sustainability Considerations

Reduced reliance on critical raw materials and European-based manufacturing improve supply chain resilience.

8. Strategic Implications for European Toolmakers

Material selection increasingly involves risk management, cost stabilization, and supply chain resilience.

Ultra-hard high-speed steels provide diversification beyond cemented carbide.

9. Conclusion

Rising tungsten carbide prices are driving strategic material shifts. Vibenite grades achieve up to 76 HRC hardness, deliver high wear resistance, maintain useful toughness, reduce reliance on critical raw materials, and enable additive manufacturing design freedom.

Contact Information

VBN Components AB
www.vbncomponents.com
info@vbncomponents.com

Advanced Tool Materials – Redefining wear resistance by Additive Manufacturing

For technical data sheets or application discussions, please contact us.