Cemented tungsten carbide has long been used in applications where resistance to wear and corrosion are important. Historically, one constraint for cemented carbide in these applications has been the difficulty in shaping the material into complex geometries. The challenge of manufacturing complex internal geometries and external features of certain components resulted in the use of other materials with far less wear resistance, such as steels or Stellite™ alloys, or the use of carbide parts that need to be oversized to overcome manufacturing constraints.

Hyperion Materials & Technologies has developed an additive manufacturing (AM) process that delivers the wear resistance of cemented tungsten carbide even in components designed with complex geometries. This process eliminates design compromises previously required to gain the material advantages of cemented carbide.

Stellite® is a registered trademark of Kennametal Inc.
**CHALLENGE**

Until now, the use of cemented tungsten carbide in many applications was limited by shaping constraints and customers were left with few alternatives. This resulted in the use of Stellite™ or steels to manufacture complex parts. Materials like these do not have the optimal characteristics to withstand stressful applications, thus often resulting in premature wear and failure. Without the right material for the application, time, productivity, and money were lost.

These production limits also meant many customers have been forced to compromise their ideal designs and left with sub-optimal geometries for their application, as they need to conform to the supplier’s manufacturing capabilities. The resulting designs are lacking and create inefficiencies. If the manufacturing constraints were overcome, and cemented tungsten carbide could be used in these applications, the enhanced performance of the components would extend the life of the parts, reduce the maintenance rate, and save time and money in the process.
SOLUTION

AM is defined by ASTM as “a process joining materials to make objects from 3D model data, usually layer upon layer, as opposed to subtractive manufacturing methodologies”. AM is a transformative technology that allows tungsten carbide to be made into geometric shapes that have never before been available.

Hyperion Materials & Technologies’ unique additive manufacturing (AM) capability gives us an industry leading position from which to design complex parts and components and optimize designs that will increase the efficiency of processes in wear applications across many industries.

Our AM process allows our manufacturing experts to collaborate with customers on new geometric features that could enhance component performance or even to create new shapes to solve current challenges. The following are just a few examples of customer challenges that have benefited from Hyperion’s AM expertise:

- Internal coolant channels to improve heat transfer and avoid thermal fatigue
- Internal complex geometries to ameliorate flow mechanics in fluid handling applications
- Geometries that cannot be obtained using conventional manufacturing techniques
  - External and internal geometries with and without asymmetric revolution shapes
    (Note: shapes that cannot be produced with a lathe machine)
  - External and internal geometries that cannot be created with 5-axis computer numerical control (CNC) machines
  - Rounded vertex without presslands
  - Progressive rounded edges and corners.

In addition to the ability to create new and complex geometries, Hyperion’s AM process presents other advantages:

- Rapid prototyping: Part geometry is quickly verifiable and can be quickly modified if necessary
- Small batch production: There is no order minimum or costly unnecessary inventory
- AM is a ‘green’ process: As it is a near-net shape process, the amount of tungsten carbide powder used for manufacturing the parts is minimized and less waste is created.
CONCLUSION

AM is an exciting new technology that enables Hyperion Materials & Technologies to create cemented carbide parts in shapes never before available. Hyperion’s R&D expertise has been leveraged into the ability to create prototypes and other small batch green solutions that position our customers to win.

To schedule a consultative discussion with one of Hyperion’s Additive Manufacturing experts or to find out more about how your business can benefit from the complex cemented carbide parts Hyperion’s AM process can produce, email marketing@hyperionmt.com, contact your local Hyperion salesperson, or visit www.HyperionMT.com/AM