Comparison of Binderjet and Laser Powder Bed Fusion for Co-Cr alloys

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ABSTRACT

The properties of Co-Cr alloys comprising the Stellite ™ alloy family can be tailored to a variety of wear applications and aggressive environments. These versatile alloys have significantly different properties as a result of processing such as casting, PTA (Plasma Transferred Arc) welding, HVOF (High Velocity Oxy-Fuel) process, P/M (Powder Metallurgy) sinter or P/M HIP. Additive manufacturing processes such as laser powder bed fusion and binder jetting largely affect microstructure and resulting properties. The major differences in microstructures between binder jet processed and laser powder bed fusion Stellite ™ alloys are carbide distribution and grain size. This presentation will discuss the different capabilities of binder jetting and laser powder bed to make complex geometries and the effect of processing on key properties of Stellite ™ Alloys.

INTRODUCTION

The Stellite ™ (Kennametal ™) alloys have been recognized as standardized material solutions to a wide range of industries, including aerospace, oil & gas, automotive, and power generation industries, due to the excellent combination of mechanical wear resistance, especially at high temperature, and corrosion resistance. The Stellite ™ alloys are mostly Co based with additions of Cr, C, W, and Mo. The lower carbon alloys are selected for cavitation, sliding wear, and moderate galling. The higher carbon alloys are selected for abrasion, severe galling, and low angle erosion applications [1].

Sand casting, investment casting, and machining are common manufacturing processes to produce complex shaped components from Stellite ™ alloys. The casting processes require tooling to produce molds and cores, which takes time to procure. These processes are more suitable for large part quantities