TRITONE PRO-TIPS

Boosting Green-to-Green Sinter Bonding Strength with a Simple Method



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CHALLENGE:

Sinter bonding is a solid-state process where powder material particles are fused by heating them to just below their melting point. At this sintering temperature, particles bond through atomic diffusion, resulting in a high density part. This technique is particularly useful when joining components produced separately due to constraints like size, cost, or other manufacturing requirments.

A common application of this process is joining "green to green" (unsintered to unsintered) or "green to bulk" (unsintered to sintered) parts. In this pro tip, we focus specifically on optimizing the green-to-green sinter bonding process while improving the joint strength.



SOLUTION

With MoldJet Technology, we produced two halves of a cylindrical container using 17-4 PH alloy. These green parts were then sinter bonded under varying levels of applied pressure. During the sintering cycle, different Tungsten weights were placed on top of the joint to enhance the bond faces contact and diffusion.

After sintering, tensile specimens were extracted from the bonded parts and tested to evaluate the joint strength and compare it to industry benchmarks



Figure 1: Parts Manufactured

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Figure 2: Container used for the test



Figure 3 : Tensile specimen extracted from the part



KEY BENEFITS:

- Enables the joining of complex or large assemblies that cannot be produced in a single building.
- > Offers enhanced flexibility in part design, manufacturing, and material usage.
- > Supports modular production strategies, reducing overall cost and complexity
- Opens new possibilities for additive manufacturing and hybrid manufacturing methods.



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SUCCESS:

- Significant strength improvement was observed when weight was applied during sintering
- Applying a 600 g weight to the bond during sintering resulted in a tensile strength reaching 97% of the MPIF Standard (MPIF-35) minimum ultimate tensile strength for 17-4 PH metal injection molded parts
- The sinter bonded container was visually and functionally identical to a conventionally manufactured counterpart

Specimen	Weight app lied to connection	Tensile strength
ID	g	Rm, MPa
GR.1-1	0	629
GR.1-2	0	488
Mean	0	559
GR.2-1	200	710
GR.2-2	200	623
Mean		667
GR.3-1	400	780
GR.3-2	400	787
Mean		784
GR.4-1	600	872
GR.4-2	600	874
Mean		873
MIM MPIF-35	Minimum Ultimate Tensile Strength	900 MPa

The results of the test are shown in Tab 1.

Tab 1: Correlation between weight applied on container and tensile strength



CONCLUSION:

When joining green parts using sinter bonding, applying modest weight during the sintering process can dramatically improve joint integrity—bringing your part's performance up to industry standards. It's a simple addition to the process, but one that can unlock manufacturing opportunities and design freedom.

