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Hot isostatic Pressing interest for Turbine parts in future Engines

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One of the main challenges for the next generation of aeronautic engines aims at reducing consumptions and environmental impact like emissions and noise, in improving at the same time the performances and efficiency. To reach these objectives, an increase of the engines internal temperature is needed.
In the turbine, increasing temperature is already possible for the discs with the use of cast and wrought superalloys like Waspaloy, U720, AD730, Rene 65 or for hottest or most solicited locations, powder metallurgy (PM) materials. Materials capable to provide highest mechanical characteristics are indeed available on the market, nevertheless their very poor workability (for PM) and the actual very expensive industrial route able to produce them limit drastically their use to simplest shapes and most critical parts.
The use of Hot Isostatic Pressing (HIP) technology to directly produce near net shape (NNS) components using powder materials is an efficient solution to propose parts with complicated shape, impossible to produce today by another way, with very high mechanical properties, and at a competitive price compared to the significant technical gains.
This paper intends to show the interest of the HIP process for parts of engines low pressure turbines, already produced in Aubert&Duval as demonstrators in PM ’ superalloys: First, a static turbine casing in Astroloy highlighting the possibility to produce a NNS complex shape with higher mechanical properties than actual solution; Second, possibility to produce turbine parts in material N19 (Safran superalloy) allowing reaching an excellent compromise of tensile, creep, fatigue and crack growth properties.

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