



Uddeholm Tyrax[®] for AM

The Solution for the Medical Injection Moulding Industry

TEXT: MAGNUS GLANS – PRODUCT MANAGER UDDEHOLM

In February of 2025 Uddeholm launched their new material for additive manufacturing, Uddeholm Tyrax for AM. It was based on the successful story of Uddeholm Tyrax ESR, material that is known for its corrosion resistance, high polishability, good ductility in combination with a working hardness of 56-58 HRC.

Uddeholm, part of the voestalpine Group, offers a complete additive manufacturing solution combining premium metal powders with advanced technologies such as heat treatment and 3D printing. With a global network of AM centers, customers can access high-quality raw powder or finished printed components tailored for tooling applications like plastic injection molding and high-pressure die casting. A case study highlights how Uddeholm's materials and voestalpine's AM expertise enable optimized tooling design and improved performance.

THE PRODUCT

Building on the proven success of Uddeholm Tyrax ESR an electroslag remelted bar grade that has been addressing critical challenges for plastic injection molders worldwide since 2019. Uddeholm Tyrax ESR is known for its corrosion resistance, high polishability and its good ductility in combination with a working hardness of 56-58 HRC. Uddeholm now offers the alloy in powder form as Uddeholm Tyrax for AM. Produced at the Uddeholm mill in Hagfors, Sweden, the powder is manufactured via advanced inert gas atomization, yielding highly spherical particles of exceptional purity, with a tightly controlled size distribution and outstanding flowability. Uddeholm Tyrax for AM is supplied in two standard fractions: 20–50 µm for Laser Powder Bed Fusion and 50–125 µm for Laser Metal Deposition (see Figure 1).

On top of being the number 1 supplier of high performance tool steel, Uddeholm puts a lot of effort and work into safety and environmental aspects. Additive manufacturing offers a more sustainable way of manufacturing tools, building up a tool, instead of the traditional toolmaking, meaning removing material. This assures less waste of material.

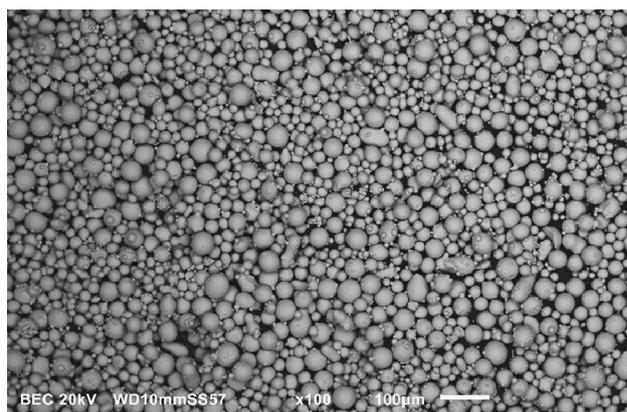


FIGURE 1 Uddeholm Tyrax for AM powder

Uddeholm Tyrax for AM is delivered with SDS (Safety Data Sheets) - a critical safety tool that ensures legal compliance, protects human health, and helps prevent environmental harm across the supply chain. SDS provide essential information about hazards, safe handling, storage, exposure controls, and emergency measures, improving the following:

- Worker Safety - Helps employers protect workers from chemical risks and ensures proper use of personal protective equipment
- Environmental Protection - include guidance on disposal, spill response, and ecotoxicology.
- Legal Requirement – Not just a formal document, it ensures legal compliance.
- Supply Chain Communication - Informs actors in the supply chain are required to perform risk assessments and implement appropriate safety measures.

OFFERING THE FULL SOLUTION

Uddeholm is part of the voestalpine Group, which provides access to an extensive range of advanced technologies, including heat treatment and additive manufacturing. These capabilities enable us to deliver enhanced support to our customers across the tooling industry.

As a result, we are able to offer industry-leading powder materials specifically developed for plastic injection molding and Hot work applications like high pressure die casting. This offering is further strengthened by our global network of AM centers located in Germany, the United States, China, Taiwan, Singapore, and Canada. The Customer can choose to purchase a high-quality raw powder for their own production needs or opt for finished, printed components manufactured at one of our printing facilities.



Uddeholm Tyrax for AM Container

CASE STUDY

To demonstrate the significant benefits of combining premium raw materials with high-quality additive manufacturing services, we present a case study highlighting design optimizations for improved tooling performance. This case study features Uddeholm’s advanced powder materials and the additive manufacturing expertise of the voestalpine AM Centers in collaboration with Advanced Remanufacturing and Technology Centre Singapore (ARTC) and industry partners, showcasing how tailored tooling design can lead to measurable performance enhancements.

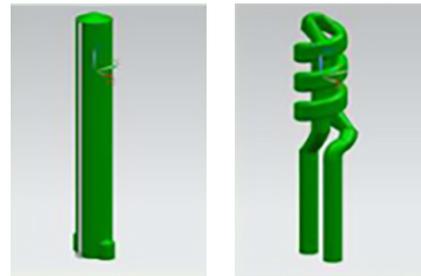
Background

A standard polypropylene medical container was selected as the focus for performance improvement. In conventional tooling line-of-sight cooling channels often lead to uneven temperature distribution across the tool surface. Such variations can adversely affect material flow and compromise the quality of the molded part. Given the thin-walled design of these containers, the molding process is particularly susceptible to quality defects such as warpage and distortion.

Improvements

An existing single-cavity mold was selected for optimization. The cavity, core, and sliders were identified as key components with potential for redesign to incorporate conformal cooling. The following requirements were defined as part of the tool redesign process:

- Raw material will be switched to a dedicated plastic injection moulding material, like Uddeholm Tyrax for AM.
- Cooling channel design will improve cooling circuit efficiency to reduce overall cycle time.
- The diameter and shape of the cooling channels will be optimized to increase cooling circuit flow rates.
- Cooling channel design will address hot spots and temperature deviations to reduce potential defects.



Former design

Optimized design

RESULTS

The table below shows the costs for each configuration of tool (1, 4 and 8 cavities) with an assumed insert tool life of 5 million shots. The additional cost of producing AM tooling was included in each tool calculation. As shown the additional benefits of AM tooling (cycle time reduction etc) outweigh the initial investment cost for all tool configurations.

TOOLING ECONOMY			
Conventional	19.907 €	59.404 €	101.721 €
Conformal cooling costs	23.715 €	73.613€	123.784 €
Difference	-3.808 €	-14.209 €	-22.063 €
Number of plastic parts produced	1.500.000	6.000.000	12.000.000
Cycle time reduction	26%	26%	26%
Winning opportunity	16.122 €	64.486 €	128.973 €
Total profit	12.314 €	50.278 €	106.910 €

TABLE 1 This dataset was created in cooperation with ARTC

- Cycle time reduced from 19 sec to 14 sec (26%)
- Tighter tolerances of the plastic part (due to homogenous cooling)
- Additive manufacturing pays off for single and multi-cavity molds



FIGURE 3 Medical Container