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,debind-and-sinter' AM



- 1 Debinding station
- 2 Fan for ventilation of the debinding unit
- 3 Compartment for solvent tanks
- 4 Sinter furnace
- 5 Cold trap (behind the cover)
- 6 Control unit
- 7 Connection between the modules and the crane eyes
- 8 Machine feet (rollers)

The idea of modules extends the application possibilities of the system. Modules can be substituted and/or added to meet the requirement of different binder systems and different metal alloys or even MMCs.

Modules for post sintering heat treatments and surface treatments have yet to be developed. Currently we offer stand alone heat treatment vacuum furnaces with high pressure gas quenching.

- The sinter furnace can be shipped in compliance with:
- AMS 2750 E (aerospace industry)
 - CQI-9-HTSA (car industry)
 - Title 21 CFR Part 11 (medical industry)

FDA U.S. Food and Drug Administration
Protecting and Promoting Your Health

AIAG
Automotive Industry Action Group

CE

SAE Aerospace
An SAE International Group



Debinding

The process of binder extraction begins with submerging the „green part“ in a solvent bath inside the debinding station.

The solvent extracts the majority of binder from the green part. It soon creates micro-channels that further allow it to penetrate deeper into the green part. The majority of the binder is thus washed out and the micro-channels created further act as an outlet during thermal decomposition of the remaining organics, which takes place in the sinterfurnace prior to the actual sintering step.

The entire process is highly automated. The operator will not come in contact with solvent or solvent vapor.

Debinding lasts for several hours. Post debinding the part has become a so called „brown part“.



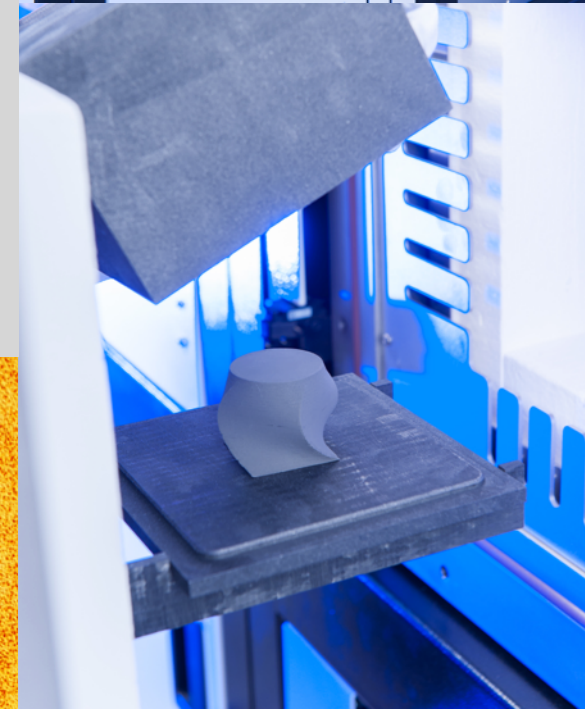
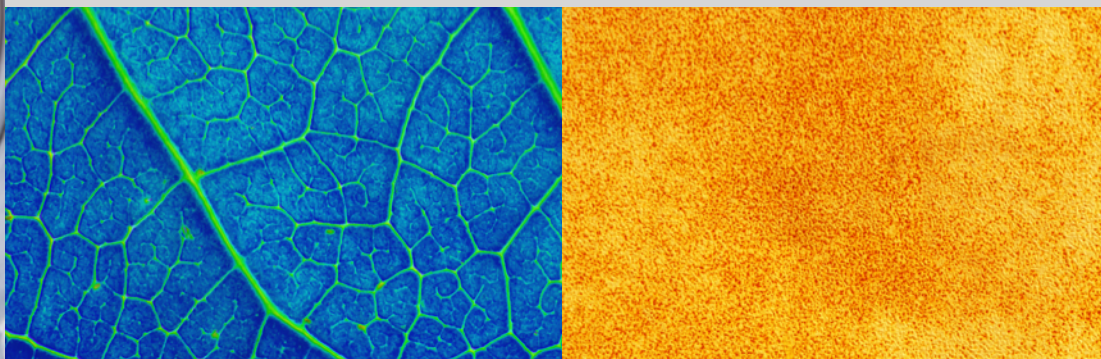
Sintering

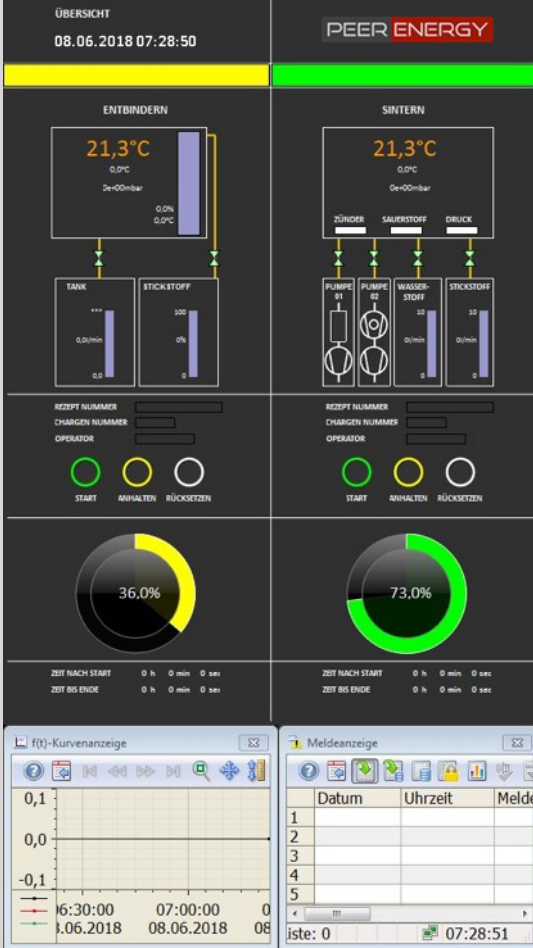
The just produced „brown part“ is merely metal powder held loosely together and would break, if not handled gently. Sintering will transform the brown part into a solid metal part.

First the brown part is heated up to decomposition temperature of the residual binder. After complete removal of the binder the part is ramped up to sinter temperature and sintered.

The sintering process takes place at temperatures beyond 1000 °C causing the metal powder grains to fuse together, which makes the material compact and dense. Sintering goes along with shrinkage, which means material allowance must be considered by the same extend.

The atmosphere in the furnace is determined by the to be sintered alloy - it can be 100 % H₂ or Inertgas or high vacuum, etc . . .





Technical data Control Unit:

Dimensions:

800 mm x 1200 mm x 1800 mm (w x d x h)

Controller:

Siemens S7 – 1500 controller partially fail-safe

HMI:

42" Touch Screen; process visualization and recipe editing for all units

Report: PDF format

Alarm: Optical and acoustical indication

Data download interface: USB

Technical data Debinding Unit:

Dimensions:

800 mm x 1200 mm x 1800 mm (w x d x h)

Working space:

150 mm x 150 mm x 150 mm (w x l x h)

Debinding method:

Solvent debinding

Solvent:

Acetone / Isopropyl alcohol

Tanks:

30 l for pure solvent

30 l for impure solvent

ATEX conformity:

Yes

Protective gas:

Nitrogen

Gas flow:

0 ... 10 l/min

Level control in vessel:

Digital weighing scale

Level control of used acetone:

Digital weighing control

Heating system:

Electrical

Temperature range:

10 ... 90 °C

View glass:

Diameter 160 mm on the front

Technical data Sintering Unit:

Dimensions:

800 mm x 1200 mm x 1800 mm (w x d x h)

Working space:

150 mm x 150 mm x 150 mm (w x l x h)

Heating system:

Electrical

Heating elements:

Cermet material

Charging system:

Drawer type with electro-pneumatic clamps

Maximum sintering temperature:

1450 °C

Sintering atmospheres:

N₂, H₂, Ar, Vacuum or Air

Vacuum pumping system:

Rotary vane pump with cold trap in the suction line

Pressure regulation:

10 ... 500 mbar abs (only N₂)

Ultimate vacuum:

5E-2 mbar (cold, dry and empty)

Gas flow N₂:

0 ... 10 l/min

Gas flow H₂:

0 ... 10 l/min

Options:

Instrumentation and recording according to AMS 2750E, CQI-9-HTSA or 21 CFR Part 11

The Control Unit is the Centralized Processor of all data. With high precision it carefully co-ordinates and synchronizes every step in the process chain, while complying with necessary industrial standards.

Fail-safe features ensure redundancy and an extra large touch screen makes the operation of the entire system very user friendly.

The on-board data management system stores the by the user pre-programmed „recipes“ and ensures excellent quality and repeatability of the processes.

In addition to this, the Graphical User Interface enables complete supervision and control of all process parameters and it even permits multi-tasking through network-assisted communication between the MetalMerger® and your desktop.

Sailent features of the Contol Unit:

- Overview of all process parameters through user interface
- Capable to store and implement data from the 3D printing process.
- Capable of creating a complete report of the entire process chain incl. lot number, process parameters and user name
- Ability to run the cycles in the individual units in parallel to speed up production
- Built in redundancy against failure
- Optical and acustical signals for warnings and alarms
- Remote access to the MetalMerger