

# Highest Quality Sand castings for Aerospace

Présentation – **Fabrication additive**  
« **Qué hay de la Fabricación Aditiva**  
**en transfronterizo?** »

Donastia 12 décembre 2017

VENTANA

## OUR KEY NUMBERS



**55**  
SALES (M€)

**7**  
SUBSIDIARIES



**40**  
CRAFTS



**500**  
EMPLOYEES

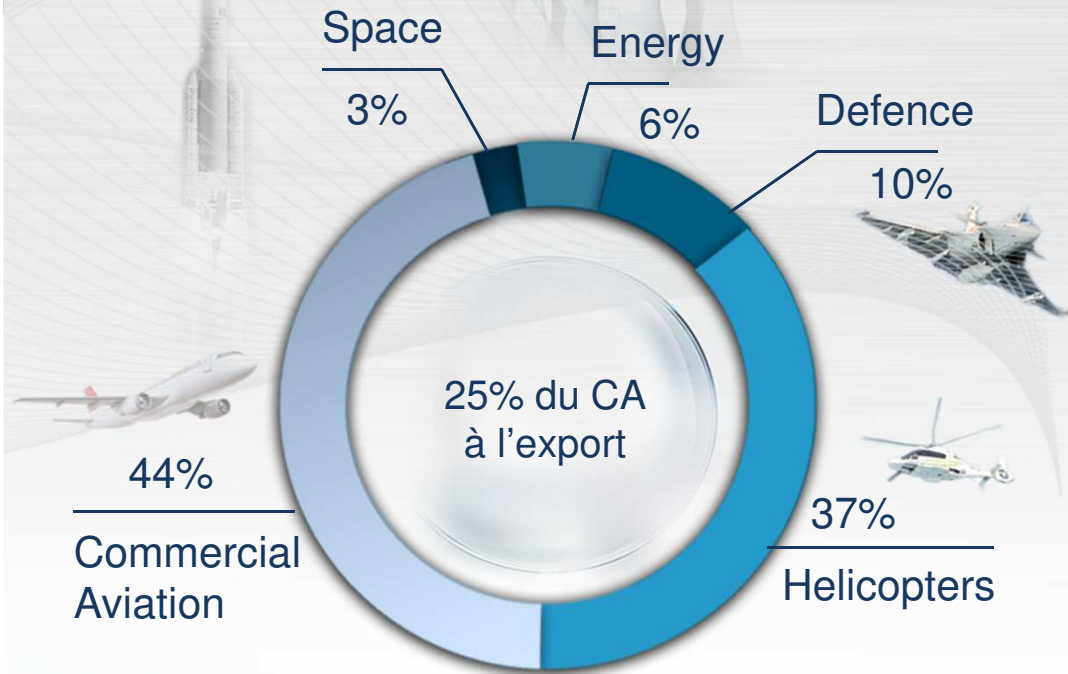


Manufacturer of innovative industrial solutions  
offering a **complete range** of production processes  
for high technological metallic parts and sub-assemblies

Sand casting  
Investment casting  
Machining  
Sheetmetal forming



# MARKETS OF THE FUTURE WITH WORLDWIDE CUSTOMERS



<b>Airbus Group</b>	21%
<b>GE</b>	5%
<b>Liebherr</b>	11%
<b>Rolls-Royce</b>	10%
<b>Safran</b>	34%
<b>Thales</b>	7%
<b>Others</b>	12%

**Our Markets**  
*(Dependency ratio < 45%)*

**Our Customers**  
*(Dependency ratio < 35%)*



# AGILE 2018 : THE INDUSTRIAL AMBITION OF THE GROUP

Our business plan is built around 3 strategic objectives

● Cost reductions

**VENTAN**  **AGILE**

Growing in magnitude ●

● Investment in innovation



# MECHANICAL DIVISION

Demand for high precision

**Argenteuil, Narcastet & Taverny**

- 140 people with shared resources (Procurements / Investments, QHSE, Continuous Improvement)

- CAD, Programming with NCSimul simulation

- 9 500 m<sup>2</sup> workshop

- Vertical lathes up to 2 400 mm diameter

- Continuous 5-axis milling up to 3 500 mm



Sheet metal working and precision mechanical welding with associated NDT

High precision machining up to 3500 mm

Assembly of gas turbines and complex mechanical sub-systems



- DIXI DHP 80 high precision 5-axis CNC machining center



- Heat treatment and NDT

- Automatic welding



- 5 workshops for assembly, control and adjusting



- A common ERP for all the subsidiaries



# FOUNDRY DIVISION

Meeting requirements

**Arudy, Hackàs,  
Kapfenberg, Toulouse**

Sand, Investment and  
Plaster Mould precision  
casting of heavily cored  
small, medium and large  
complex parts made  
of aluminium and  
magnesium alloys and  
special steels

- 360 employees with shared resources (Purchasing/Investment, QHSE, Level 3 NDT, Industrial Maintenance, Continuous Improvement)

- Measurement by GOM, laser scan and 3D machines

- 23 000 m2 workshop

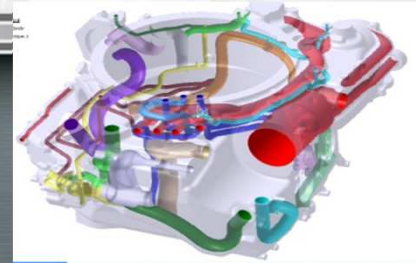
- Direct mould manufacturing without tooling

- 2 low-pressure casting units

- Heat treatment & NDT

- 18 furnaces for gravity casting

- Casting process simulation softwares

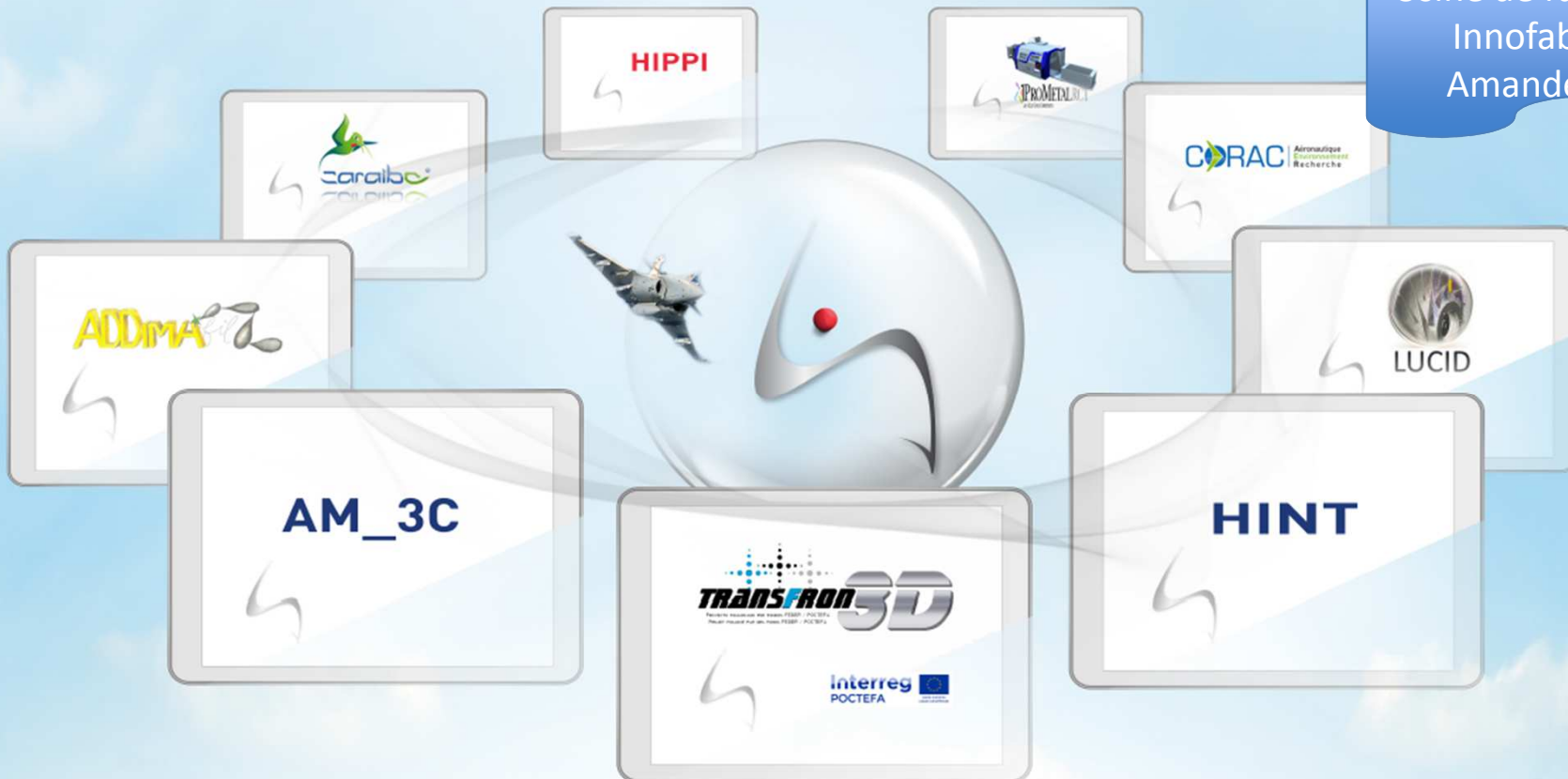


# INNOVATION TO IMPROVE OUR PRODUCTION PROCESSES

10 % of employees are dedicated to Innovation and Development

20 M€ of investment and R&T since 2003 (excluding acquisitions)

Usine de futur:  
Innofab  
Amande



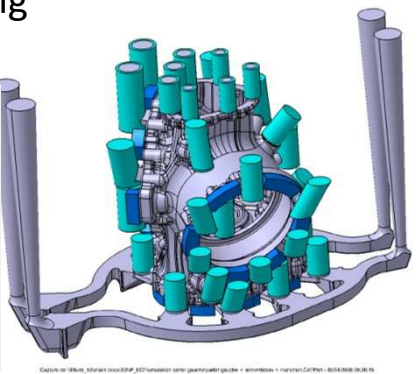
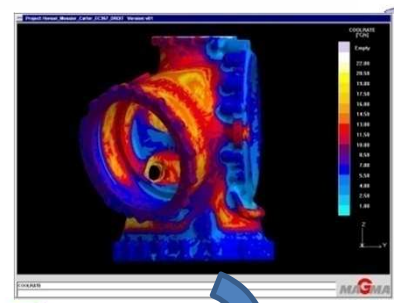
PouTo know more: <http://www.ventana-group.eu/fr/innovations/index.php>

# Digital foundry process

- > Sand printing process
- > Benefits and optimum used cases
- > Applications



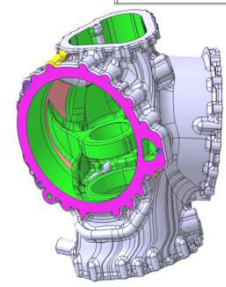
Solidification modeling



Soft or hybrid tooling



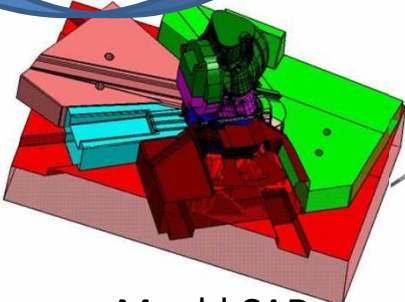
Sand block machining



3D model  
From CAD  
Or  
Reverse eng



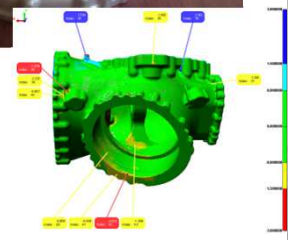
SLA mockup



Mould CAD



Printed cores



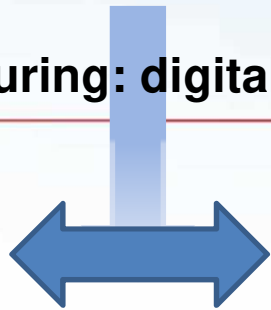
Metallurgical  
And  
geometrical  
inspection





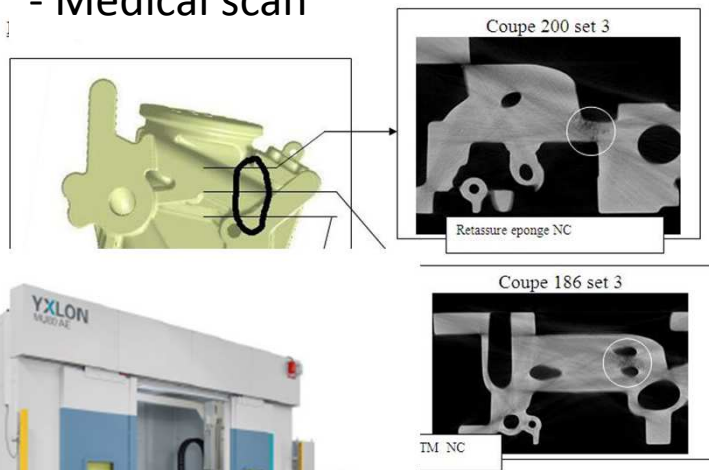
# Rapid manufacturing: digital inspection

Innovative Industrial Manufacturing



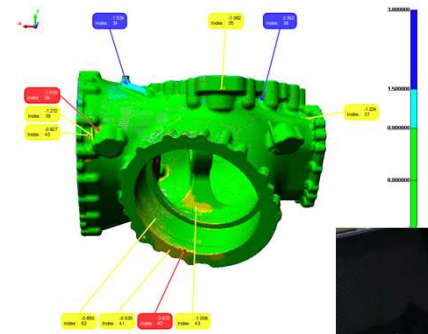
## Metallurgy inspection

- Digital Xray and penetrant inspection
- Tomography inspection
- Medical scan



## Geometry inspection

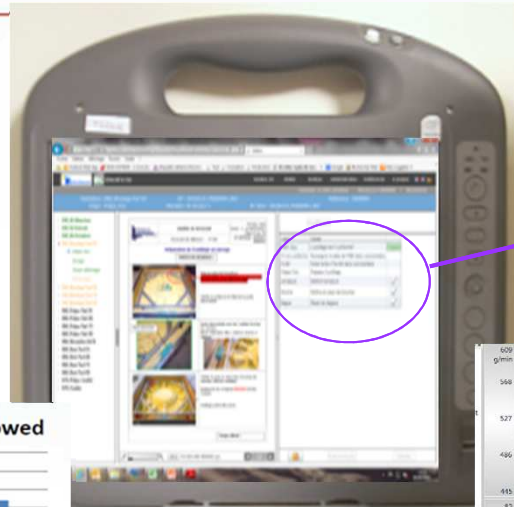
- CMM inspection
- Tomography inspection
- Contact less inspection
- Laser or Optical inspection





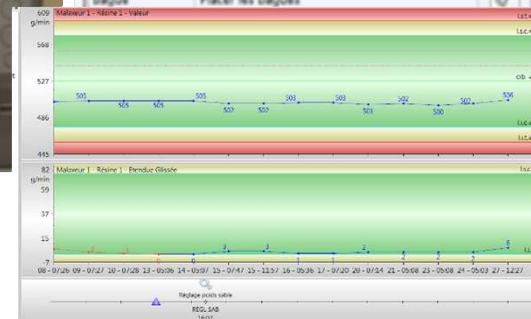
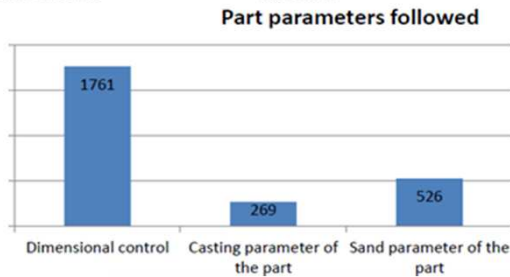
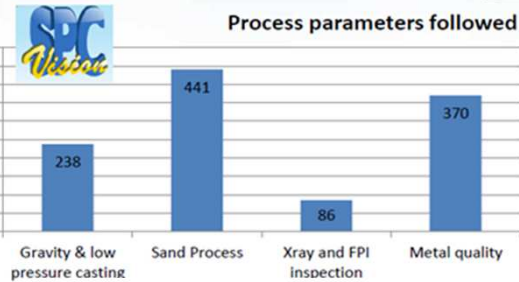
# Digital process monitoring and control

Innovative Industrial Manufacturing



Label	Libellé	
Vérif. Out.	L'outillage est-il conforme?	Saisie
Si non conforme	Renseigner la date de FOB2 dans commentaire	
Si AD	Noter le/les n°(s) AD dans commentaire	
Prépa. Out.	Préparer l'outillage	
Armature	Mettre l'armature	<input checked="" type="checkbox"/>
Broche	Mettre en place les broches	<input checked="" type="checkbox"/>
Bague	Placer les bagues	<input checked="" type="checkbox"/>

Digital working instruction on work floor tablets



Key parameters SPC Monitoring :

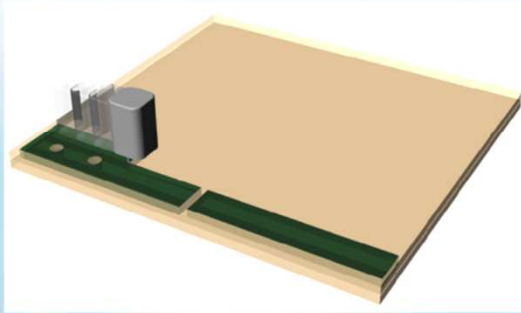
- > Test bars monitoring (X,Y,Z), length, width, height, weight, LOI, strength
- > Different positions in the box (printing angle, surface roughness)

# Digital foundry process

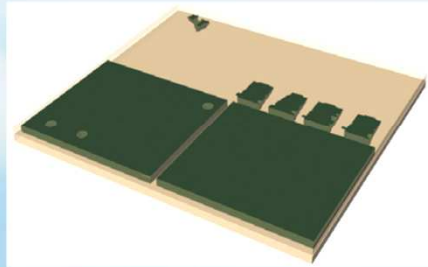
# Sand printing process



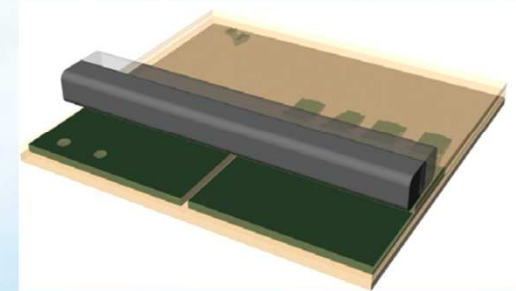
# Technology Layer by Layer



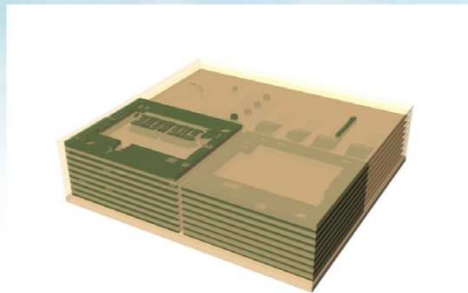
**1. Printing**  
Binder to activated sand



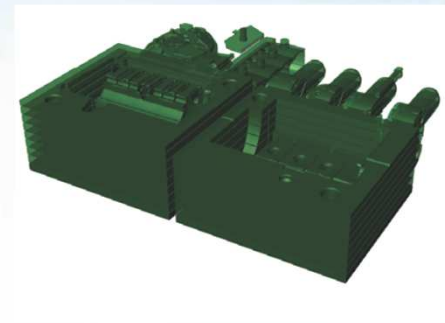
**2. Finishing of Layer**  
Lower platform by one layer



**3. New Sand layer**  
of pre-mixed sand



**4. Repeating 1. to 3. until last layer**



**5. Unloading & Finishing**  
Unbound sand is removed.





# Rapid manufacturing: mould sand printing



VENTANA



Fabrication



Désablage des pièces



Finition des pièces

## Rapid manufacturing: mould sand printing





## Rapid manufacturing: mould sand printing

### mould sand printing: technical datas

<b>Build volume (l x w x h)</b>	70.9 x 39.4 x 27.6 in. (1800 x 1000 x 700 mm)
<b>Volume</b>	45 ft <sup>3</sup> (1260 L)
<b>Build speed</b>	2.12 to 3.00 ft <sup>3</sup> /h (60–85 L/h)
<b>Layer thickness</b>	0.011–0.020 in. (280–500 µm)
<b>Print resolution</b>	X/Y/Z 0.004 in. (100 µm)

Example: Molds strength 220 N/cm<sup>2</sup> with LOI < 1,5%

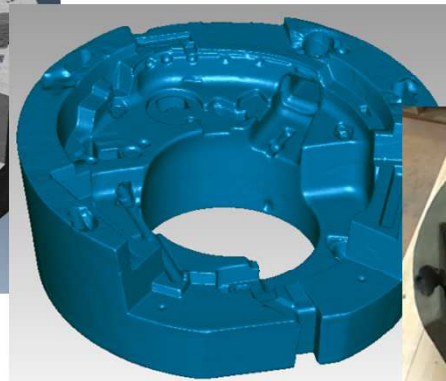
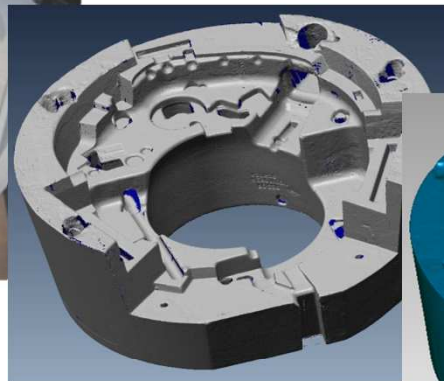
# Digital foundry process

## Sand printing applications

# Rapid manufacturing application: Reverse engineering of sand mould



Scanned core



Printed core



Comparison  
original/ printed



Same process is possible for a part

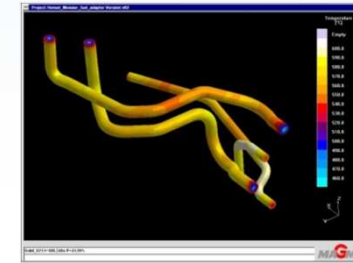
CAD adpatation

# Digital manufacturing application: Test on new conduct path for metallurgical improvement

Innovative Industrial  
Manufacturing

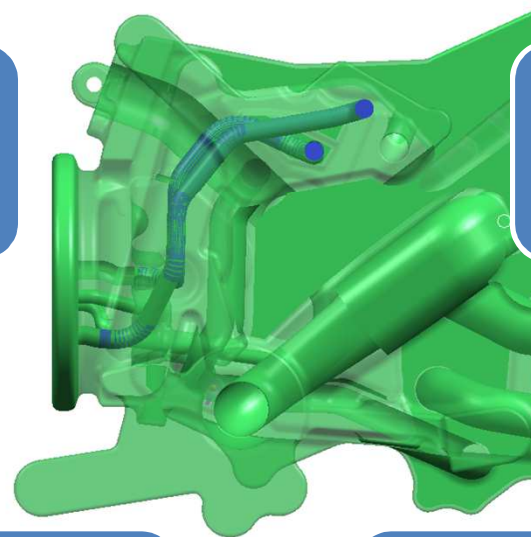


Modelling

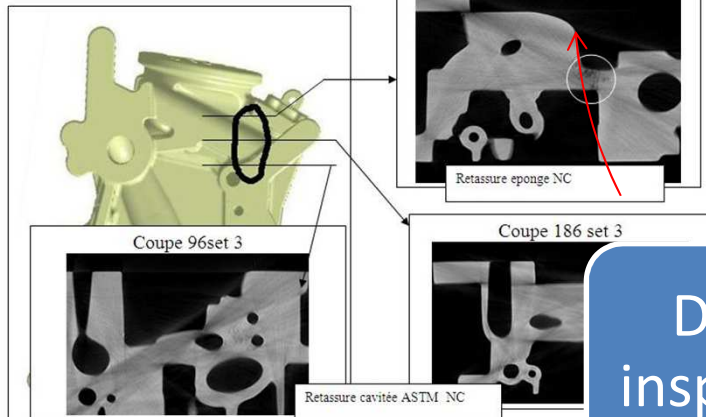


Re design

Printing



Méthod : scan medical after HIP



Digital inspection

Pouring



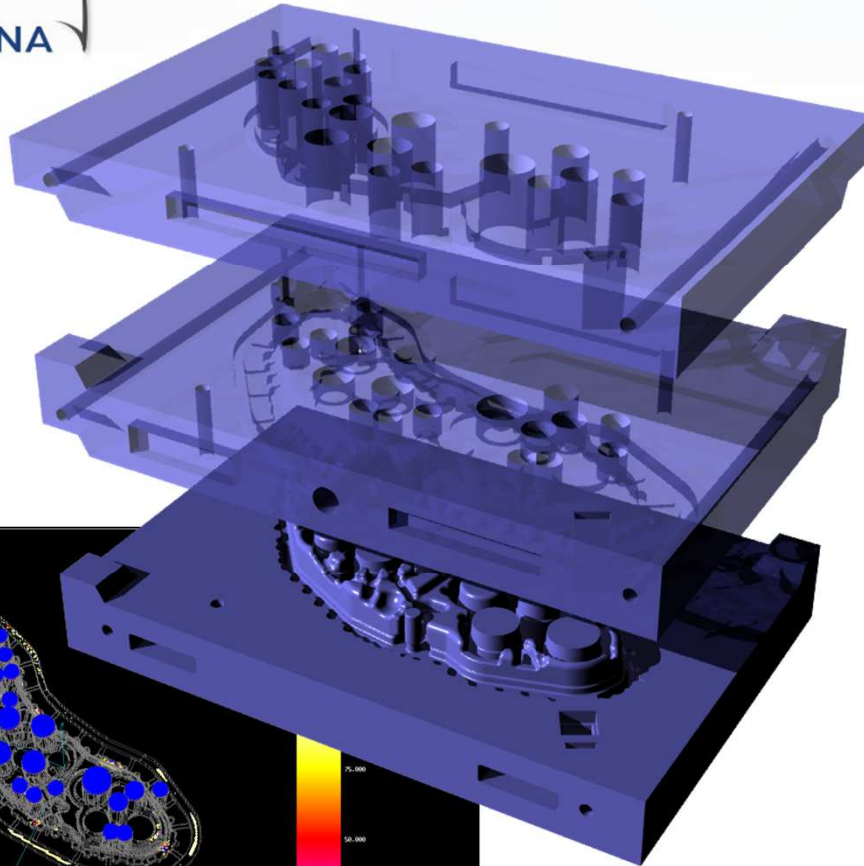
Printed core for test





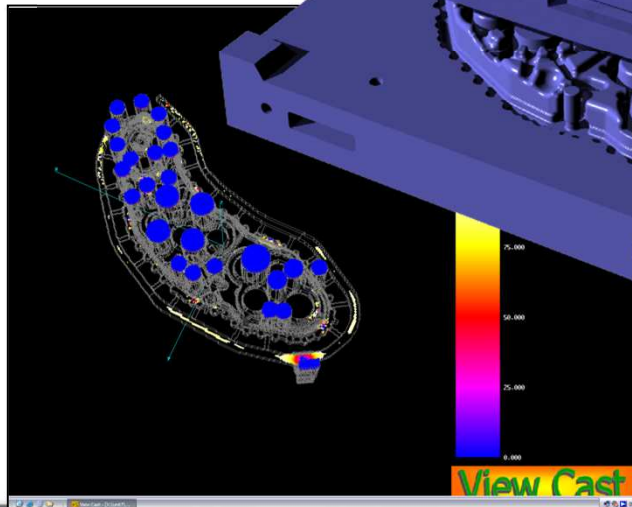
# Applications – Rapid Prototyping Gearbox housing - Magnesium

Innovative Industrial  
Manufacturing



Part is a gearbox housing,  
Approximately 8 kg  
Dimensions ~ 750 mm across  
Material: AZ91 HP

Approximately 1 week for Casting



Solidification simulation to optimize pouring and gating system.

- ***Serial parts with sand printing process qualified for:***

*Airbus,*

*Pratt and Whitney Canada,*

*Airbus Helicopters,*

- *Sadev*

*Sapa*

*Renault Sport technologies*

***Qualification in progress with:***

*Rolls Royce,*

- *Liebherr*

# Digital foundry process

> **Benefits and optimum used cases**

## Benefits

### • Advantages

Weight reduction

- Repeatability > Tolerances
- Complex shape freedom and Less cores
- No draft angle
- Easy design modifications
- Reduced NRC



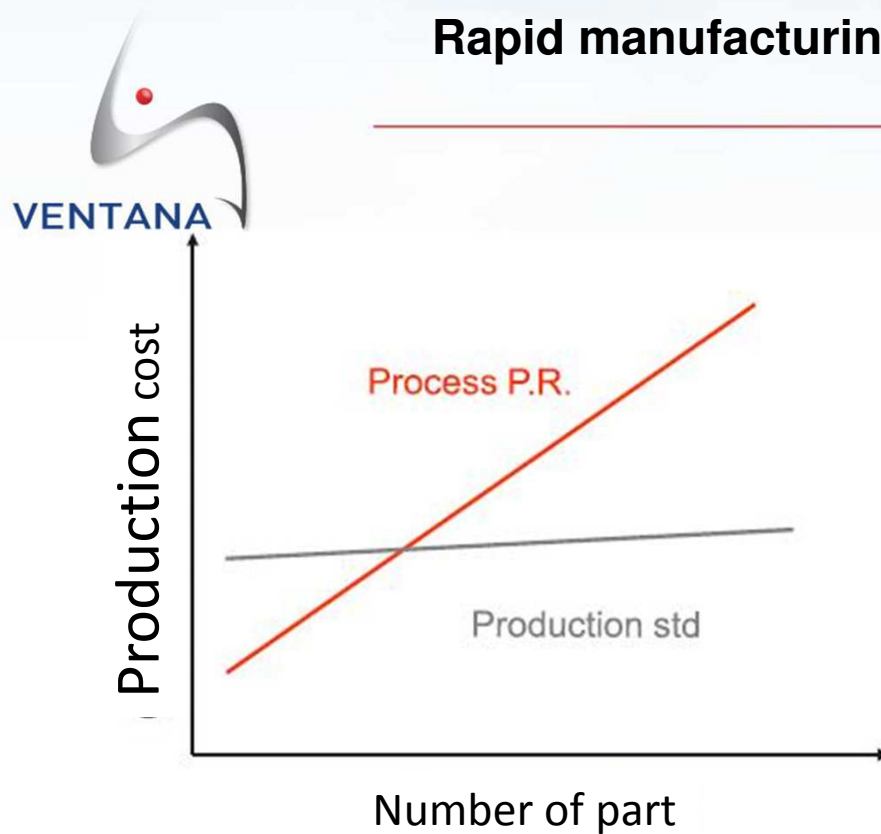
- Fatigue test results: **no impact compared with traditional casting process**





# Rapid manufacturing: mould sand printing

Innovative Industrial  
Manufacturing

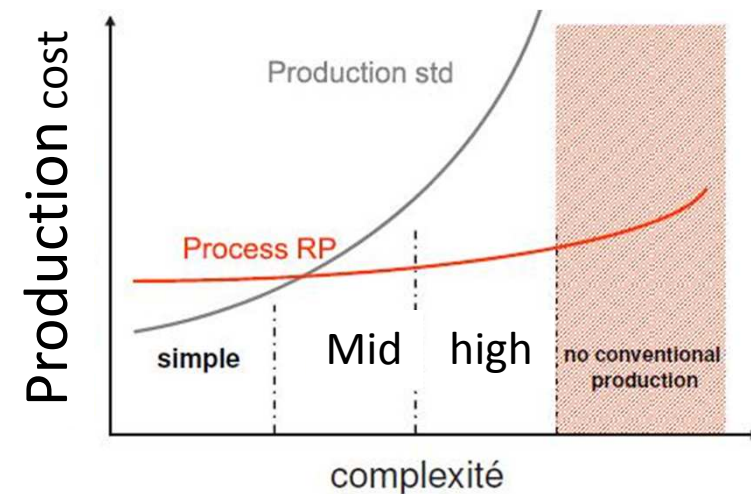


## High potentials

- hybrid solution:  
Pattern less core production +  
traditional cope and drag

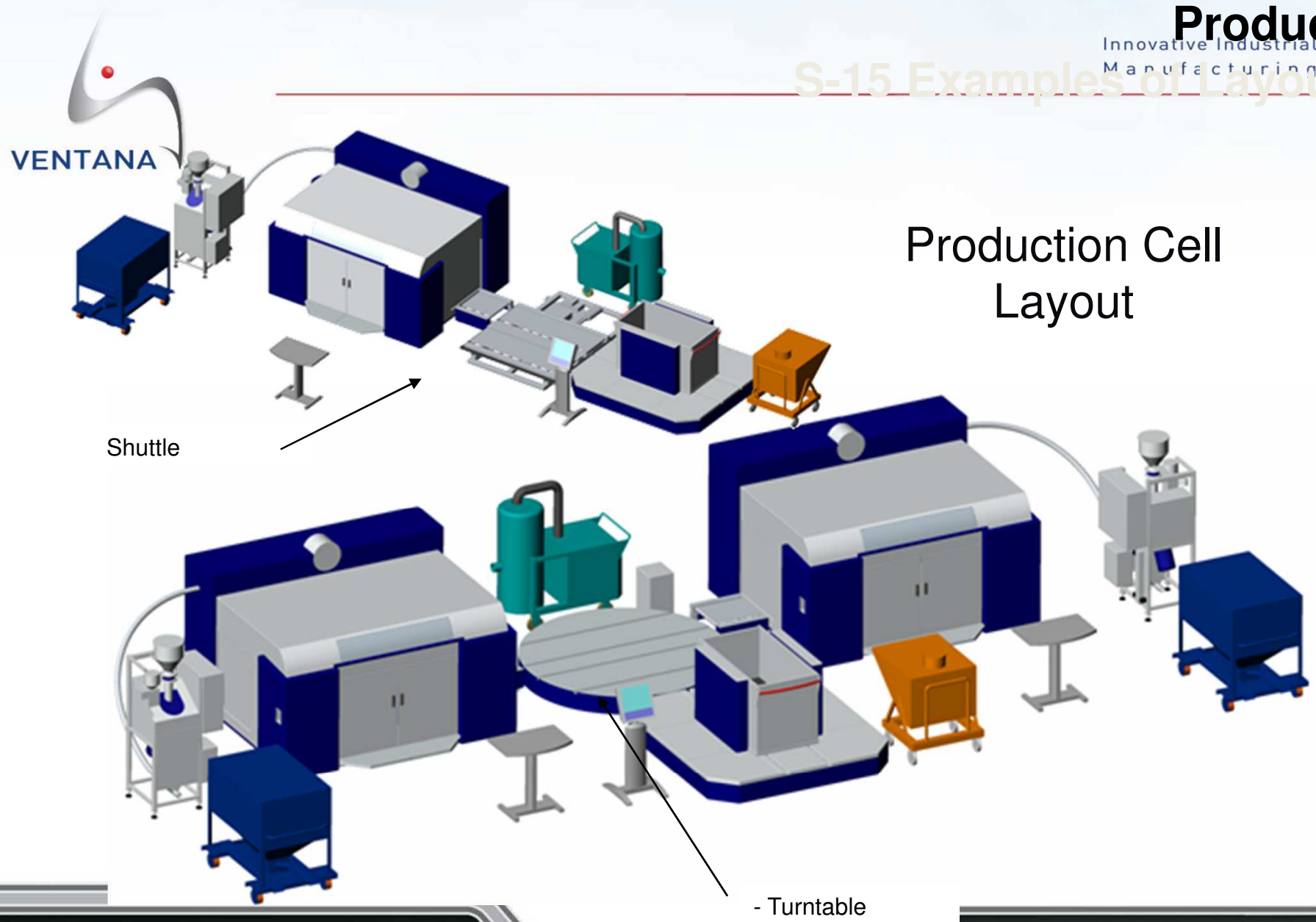
### Mold sand printing applications:

- Prototypes
- Complex casting
- Small series
- Complex cores with standard moulds
- For legacy and/or spare parts



# S-15 Examples of Layout

## Production Cell Layout





***“Conceive and implement efficient manufacturing processes, which are increasingly more respectful of people and the environment, for your high value added metal components and sub-assemblies.”***

All of our group companies are certified ISO 9001 & EN 9100 and accredited NADCAP for all special processes used

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CLIENTS & CERTIFICATIONS



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