FROM A « NICHE » AP APPROACH
TO A COMMODITY MARKET

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POWDER IS THE FUTURE OF METALLURGY

-From a limited few thousand tons market 30 years ago, gas atomized powder is regularly growing to around 45000 tons/y today.

- **High Speed Steel and Tool Steel**: Steady growth

- **HIP Components**: aerospace high temperature applications
  - offshore high corrosion resistance

- **MIM**: Complex parts … but limited to small sizes

- **ANVAL** technology supplied up to 8000 tons/year of powder made tubes to the market

- Recently **3-D printing** is attracting growing interest, even more for Industry “4.0”

- But volumes remain low because **powder supply is not sufficient and too expensive**
HOW TO CHANGE THE PARADIGM?

2 prerequisites:

- SUPPLY OF POWDER AT A COMPETITIVE PRICE

- CONSISTANT AND IMPROVED QUALITY (quality of the powder, inspectable quality of the parts)
- With very few exceptions production is done in small units each focused on deliveries of special grades with small grain sizes.

- Batch sizes are from a few hundred kg to a maximum of 5 to 10 tons.

- Elaboration is in induction furnaces with expensive raw material.

- Gas consumption is high and increases the cost.
There is no solution today to use gas atomized powder for the bulk of the market.

<table>
<thead>
<tr>
<th>Lot size</th>
<th>Part weight</th>
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<tbody>
<tr>
<td>&lt;100g</td>
<td>100g à 10.000g</td>
</tr>
<tr>
<td>Small</td>
<td>3-D</td>
</tr>
<tr>
<td>Medium</td>
<td>No solution (Except based on water atomized powder)</td>
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MMS-SCANPAC BRINGS THE SOLUTION

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Parts between 100g and 5 kg represent a huge market
-The solution relies in an increased production volume

-When the volume is big enough **gas can be recycled**
  - This is the case for the present biggest producers
    - 2 advantages:
      - almost no gas consumption (only when cleaning the tower)
      - quality: the first kilos of steel absorb the residual oxygen content
      - later on the atomization gas is 100% pure

-But a higher production volume allows to get rid of induction furnaces and to shift to steel refining.
  - This **production with an EAF and an AOD** results in a much lower cost of raw material

-And of course **fixed costs**, personnel costs etc... are almost independent of the production volume.
THIS IS WHAT METALVALUE IS GOING TO DO

With a 45000 tonnes/year production (hence doubling the present world production)

POWDER WILL COST NOT MORE THAN A ROLLED BAR
OPTIMAL USE OF THE PRODUCTION BELL CURVE WILL ALLOW TO SERVE ALL MARKETS

METALVALUE POWDER Pitres

Impression 3D
HIP
Demi-produits de forge
Spray
MIM
MMS scanpac®
SHIFTING FROM A NICHE MARKET TO A COMMODITY MARKET

- Production of powder at the cost of a bar will change the image of the powder industry

- It will become the route for
  - Energy savings
  - Reduction of recycling costs
  - Trimming the value chain with less steps
  - Generalizing additive manufacturing vs subtractive metallurgy

- Quality issues will be revisited
  - For example the oxygen content can be higher when inclusions are dispersed and thinner

- Materials can be engineered
  - Gradient materials become possible
  - Cermets
  - Wear and creep properties can be optimized

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