Process boosting using Additive Manufacturing
From LEAN Manufacturing...

- Productivity
- Safety
- Quality
- Consumption

Lean Manufacturing
Incremental improvement

... with ADDITIVE MANUFACTURING (AM)

... to Enabling Technologies

Next step

Evolution

Lean Manufacturing
significant improvement

Process boosting with AM Technologies, optimizing the tooling and digitizing complex parts, for obtaining a virtual warehouse
Objective and Scope

**OBJECTIVES**
1. Incorporate AM as a LEAN tool to improve industrial processes.
2. Training of technical workers in AM.
3. Obtaining a Virtual Warehouse with 3D files.
4. Agile Manufacturing of critical parts from 3D files to functional parts.
5. Open the opportunity of redesigning some critical parts for better functionality.

**ADVANTAGES**
- Decrease *production stops*.
- Reduce *consumptions*.
- Enhance *safety* and ergonomics of the workers.
- Reduce *immobilized* spare parts in the warehouse.
1. **Short training** in Additive Manufacturing (1-2 h) to facility workers: lean specialists, product designers, maintenance managers, supervisors, etc. Explanation of cases of success.

2. **Visit** to your **facility**: in this phase we try to understand your processes, needs and current problems to identify potential improvements using an AM approach.

3. **Redesign** and plastic prototype for customer feedback.

4. **Metal part** fabrication.

5. **Implementation** in production line (try-out)

6. **Results Analysis** (technical, ergonomics, cost reduction...)

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**Methodology**

1. Idea of improvement (Customer) → **Redesign** → **Prototype** → **Metal part (AM)** → Implementation in line → **Results**

2. Feedback
Work accident in a transversal cutting line. Reasons for the accident:

1. High number of tooling changes.
2. Un-ergonomic posture of the worker to make the change of the tooling.
3. Tooling too heavy: 15 kg (for large formats) and 11 kg (for short formats).

One adaptive tooling for both positions

Main advantages:

1. No need to change it (adaptive).
3. Ergonomic improvement - 70 % weigh reduction (4.3 kg).
Case B. Tooling optimization - examples

- Problem: high number of production stops because of brake of a lateral assembly system.
- Reason for the stop: the over weight of the assembly tooling at the top of the assembly arm makes excessive torque in the electric engine breaking the engine.

Main advantages:
1. 60% weight reduction and torque.
2. 25% cost saving.
3. Reduction of 40% in energy consumption of the whole rotatory unit.
Case C. Tooling optimization - examples

- Problem: production stops in the lateral scrap guide.
- Reason for the stop: the design of the current guide get the scrap stuck in it. In addition, the guide is very heavy making the cleaning work for the operator more difficult.

Weight = 8,25 kg

Modular prototype in plastic

Final tool made of stainless steel.
Weight = 4,3 kg

Advantages:
1. Optimized modular design to avoid scrap stuck and production stops.
2. Easy manipulation - 50% weight reduction.
Case D. Digital warehouse

Usual Problems:
- High cost of immobilized warehouse.
- Long lead time for some spare parts.
- Lack of design plans

Benefits:
1. Lower immobilized cost of the warehouse.
2. Flexibility: redesign and/or change of material to increase durability.
3. Short lead time.
4. Increase durability of the spare part
Case E. Digital warehouse - examples

Problem: Wear of the plastic actuator piston of the pedals.
Solution: redesign and pedal made of stainless steel. Increase the life of the pedal

Problem: Dilatation of plastic washing nozzles in a pickling line.
Solution: redesign (hexagonal shape) and nozzle made of stainless steel.

Problem: Break of a plastic gear.
Solution: fabrication of the gear in stainless steel.

Problem: Continuous break of the metallic cover of a manual strapping machine.
Solution: reinforced redesign and fabrication of the cover in stainless steel.