CASTOR

End-use metal production part in 9 days only

(hint, additive manufacturing)

STANLEY

Case Study Stanley Black and Decker discovers new profitability of low volume high complexity part production with Castor

"CASTOR played a fundamental role in the process which led to the integration of the first 3D printed metal production part at Stanley Black and Decker"

Moses Pezarkar, Manufacturing Engineer.

Background

Stanley Black and Decker needs

STANLEY Engineered Fastening has the world's most diverse portfolio of fastening products. Production line tooling, jigs and fixtures are necessary for efficient work at the Stanley Engineered Fastening plant in Danbury, CT. Those tools are made from highly customized parts, at a low annual production volume and combined with a high complexity geometry. Innovation in this space typically takes 8 weeks per iteration in a traditional unit production testing environment and costs can escalate quickly when multiple iterations are necessary.

In order to reduce costs in the production floor, improve part production lead time and increase manufacturing flexibility for Stanely's customers (mostly automotive, aerospace and medical device companies), Stanley's managers Initiated a plan to search for manufacturing alternatives.
At its core advantages, 3D printing, (AKA "additive manufacturing") can address those crucial requirements to improve Stanley's bottom-line savings.

These days, Stanley Engineering Fastening (SEF) engineers lack the information and in-house expertise to use 3D printing to generate profit. Despite the fact that they know Additive Manufacturing can disrupt their business, they are often not able to unlock the benefits of High-End 3D printing, to produce end-use parts in materials as sophisticated as aluminum, titanium, and steel. No longer is additive manufacturing simply a prototype production tool in different colors of plastic.

One of the engineers responsible for the initiative of exploring how 3D printing can help SEF was Mr. Moses Pezarkar. A Manufacturing Engineer responsible for deploying smart factory solutions in the production line.

Moses uses CASTOR as a Decision Support System for identifying where Additive Manufacturing can be used to create industrial grade, end-use parts. It allows him to decide whether to prefer 3D printing over traditional manufacturing methods, by providing technical analysis and cost-saving advice for a full machine design. In addition, CASTOR recommends a combination of 3D printing technology, printer and material that best fit the mechanical properties of the original design.

CASTOR automatically:

- Runs an analysis to determine 3D printability of end-use parts.
- Chooses the best suited technology for printing the part, while maintaining its functionality.
- Estimates the 3D printing costs and supplies a financial analysis vs. injection molding
- Refers Moses to a service bureau that was able to supply the parts while maintaining low costs and fast lead-time.

CASTOR assists engineers like Moses throughout the value chain from design to mass production

- In the design phase CASTOR is used to identify adjacent parts resulting in less complex assemblies and lower inventory management costs
- In the New Product Introduction ("NPI") phase, it allows the NPI managers to calculate whether it makes financial sense to use 3D printing.
- In the production line it helps finding parts that are good candidates for 3D printing, i.e. they can save time (extremely short lead time for parts) and save costs (cheaper than using molds/casting for small quantities parts)

The Case

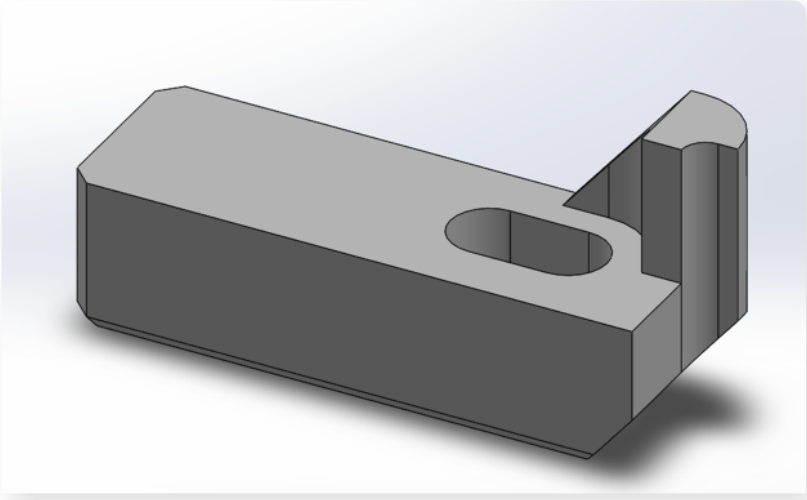
Moses uploaded multiple parts at once for analysis in CASTOR's software. The following low volume/ highly complex parts, represent a family of parts of the same kind which have long lead-time. Those parts are expensive and time consuming for Stanley Black and Decker's engineers.

Mandrel for Hand Insertion Tool	947	HI SHOCK 60
Sleeve for Hand Inserting Tool	100	A2024-T4
Prewinder Nut	50	DELRIN
Mandrel Holder	20	1215L
Wire Lifter	15	TOOL STEEL
Gear Casing	1,000	A6061-T6

Example of a BOM chart for CASTOR's analysis

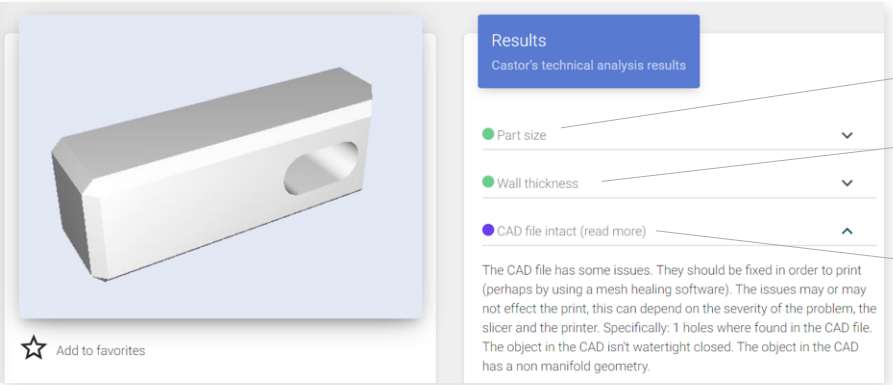
Out of this list, the part Wire Lifter was identified as a good candidate for Metal 3D Printing.

CASTOR's software identified this part after performing both technical and financial analysis, as follows



Part 51228-91_SH1

Technical analysis - The basic test:



The part's size

The part's minimal wall thicknesses limitation

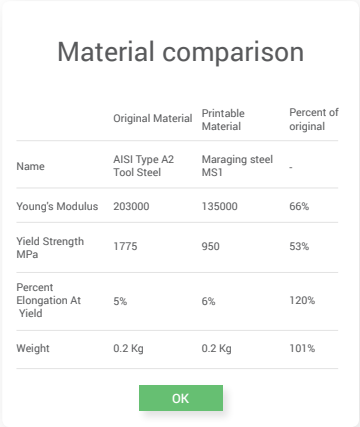
The CAD file manifoldness towards 3D printing
(minor issue was found)

A screen shot from CASTOR's report

The printing recommendation

The recommended material was Maraging Steel (1.2709), at an EOS M-290 printer, due to a strong match of mechanical properties to the original material chosen by Stanley's engineers:

The recommended Service Bureau to execute the job was FIT America.



A screen shot from CASTOR's report

Economic analysis

At an annual volume of 15 parts, the original cost was $120 per part and the 3D printing cost was $61 per part, a yearly cost saving of $1020 **reflecting almost 50% cost reduction**.
The original lead time for those parts was 8 weeks, while the 3D printed parts came **in just 9 days** reflecting cost savings of thousands of dollars.

2014649	Part:51228 - 1692829			
	LM metal part - build up	5	52.32	261.60
	Laser melting of metal powder			-
	Material is maraging steel (1.2709)			-
	Untreated without any finish work (Milling, etc.)			-
	The part is built up solidly			-
	Part will be build in 50 µm layersize	5	8.90	44.50
	LM removal of support			-
Total				**$346.10**

An example of the actual quote delivered by the service bureau

Functionality

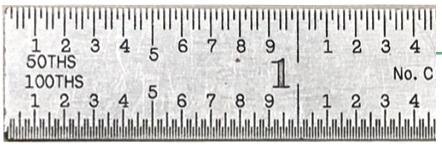
The Wire Lifter part is used as part of a machine, which produces a Heli-Coil product in the production line of Stanley Engineering Fastening.

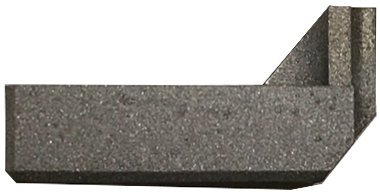
Stanely's Heli Coil

The printed Wire Lifter part

Testing

Few sample parts were initially printed for testing procedures, which lasted several weeks. The main tests were dimensional accuracy as well as actual usage in the machine, in order to test possible effects of implementing the 3D printed part on the end-product (the Heli-Coil).





Both tests showed good results.

Future Scope

As for May 2019, the engineering team in Danbury is working on incorporating other 11 parts into the project. Other tools used on the same machine will be investigated as well.

> I think that most organizations in 2019 understand that additive manufacturing has the ability to transform their business. However, the toughest part isn't acknowledging the opportunity, it's figuring out where and how to implement AM. Software like Castor, that automates the decision making process, minimizes the amount of time wasted on "how" and maximize AM's disruptive potential.

Jon Walker, EOS North America
Business Development Manager

If you wish to learn more about CASTOR's services and how to leverage Additive Manufacturing to your innovation and production processes to increase profitability and reduce lead time, please contact us at www.3dcastor.com

CASTOR

When it comes to manufacturing,
We believe intelligence helps you modernize