

WELCOME

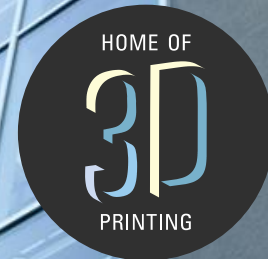
TO THE HOME OF 3D PRINTING



Tausende Teile in Spritzgiessqualität
- ohne Werkzeug?

4. AM Expertentalk

Hinwil, 12.09.2024



UNSERE HISTORIE

1992
Gründung der
alphacam GmbH in
Schorndorf (BW)



2002
Gründung der
alphacam swiss GmbH
Sitz in Winterthur



2012
Gründung der
alphacam austria GmbH
Sitz in Wien



2019
Aufnahme des LPBF-
Verfahrens in unser
Portfolio (D-A-CH)



1994
Einführung des FDM®-
Druckverfahrens in D-A-CH



2005
3D-Druckdienstleistung
TEILEFABRIK geht in Betrieb



2013
Einführung des PolyJet™
3D- Druckverfahrens in D-A-CH



2021
Aufnahme der MoldJet®
Technologie in unser Portfolio
(D-A-CH)



2021
Aufnahme der
SAF™-Technologie
P3™-Technologie
SL™-Technologie
in unser Portfolio (D-A-CH)



GENERA.
Creation made reFabre.

2022
Aufnahme der DLP-Technologie
in unser Portfolio (D-A-CH)



2021
Aufnahme von PostProcess &
DyeMansion in unser
Portfolio (D-A-CH)



EVOLVE
ADDITIVE SOLUTIONS

2023
Aufnahme der STEP -
Technologie
in der TEILEFABRIK (EMEA)

2024
...

additive manufacturing

rapid prototyping

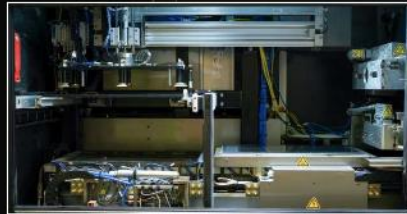
Evolve is Unique Among Other 3D Polymer Printing Companies

- Architected for Production
- Inventors of Selective Thermoplastic Electrophotographic Process (STEP)
 - Began inside of Stratasys - 10 + years of development
 - Spun out in 2017 and created Evolve Additive Solutions
 - Headquartered in Minnetonka, Minnesota, USA
 - Materials & Electrophotographic Technology Center in Rochester, New York
 - 150+ issued patents and 100+ perpetual cross-licenses



How STEP Technology Works

Selective Thermoplastic Electrophotographic Process



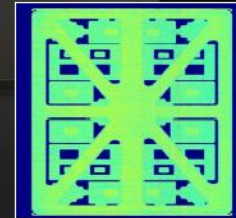
Transfusing

Heat, pressure and cooling mimicking injection molding process



Electrophotographic Imaging

- Selective deposition
- Co-printing multiple materials
- Precision registration across layers



Alignment

Closed Loop Control System

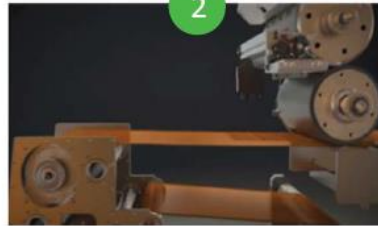
- Belt position
- Temperature
- Pressure
- Layer-to-Layer alignment

Processing Similar to Injection Molding

A toner layer is formed on a belt



The belt transport the layer to the build area



Layer fused to the build with heat and pressure



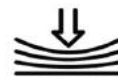
The process is repeated, and the part grows



**Electro-Photographic
Deposition**



Heat



Pressure



Cooling

...like Injection Molding

STEP Technology = No More Compromises

Superior Part Performance in 4 Key Categories:

1. Feature Fidelity

13 μm layers and 22 μm particles, fully dense, high-resolution

2. Surface Finish

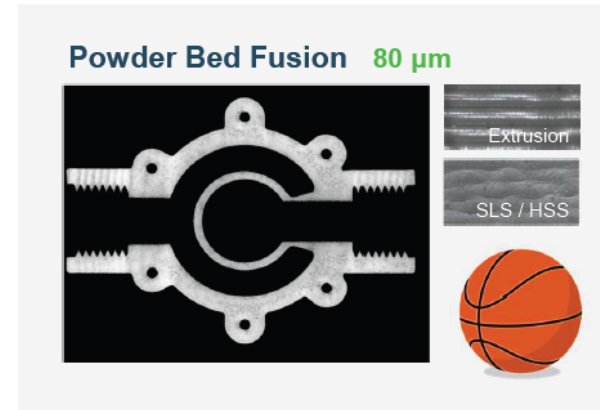
Ultra smooth surface 3-6 μm Ra as-printed

3. Repeatability

Highly accurate part-to-part, build-to-build, time-to-time

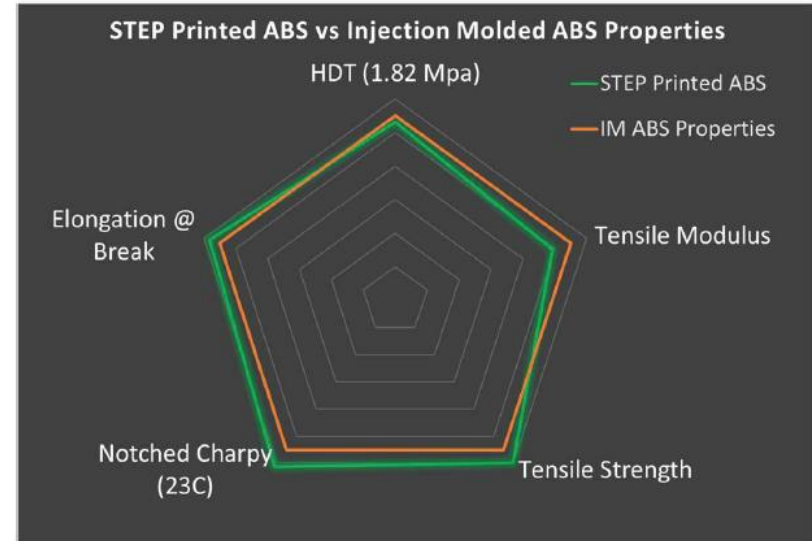
4. Mechanical Properties

Engineering-grade thermoplastics, multi-material co-printing



Additive Manufacturing with Injection Molded-Level Properties and Fidelity

Surface Finish (Ra)	3-6 μm
Min. Wall Thickness	0.2 mm
Features – min printable	40 μm
Printable Font – min	4 pt



Part Accuracy & Reproducibility

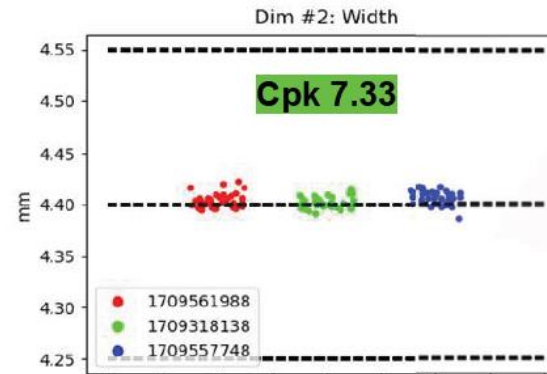
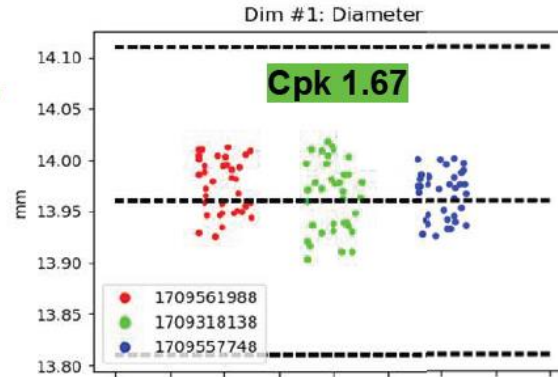
Case Study: Irrigation

Third-party measured, 108 parts

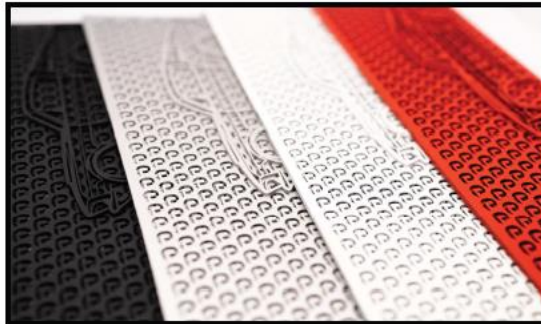
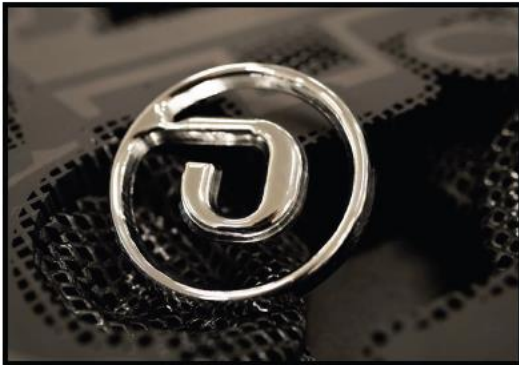
2 builds across 2 machines

NOMINAL	13.960 mm
+ TOL.	0.15 mm
- TOL.	0.15 mm
DESCRIPTION	Diameter
Dim #1 StD=0.028mm	

NOMINAL	4.400 mm
+ TOL.	0.15 mm
- TOL.	0.15 mm
DESCRIPTION	Width
Dim #2 StD= 0.0066mm	



Fully Dense ABS, Smooth Surface Finish



Standard ABS finishing

- Painting
- Electroplate
- Vapor Deposition

Co-Printing Functional Materials



4 Engine System

- Colors
- Functional Materials
- Blends

Applications



Best-in-Class Surface
Finish and Textures



Fully Dense ABS
Irrigation Manifold



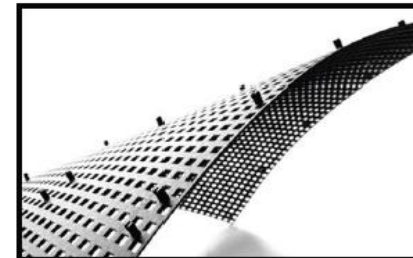
Production Throughput -
Automobile Bracket Assembly



High Precision Electronic
Housings and Snap Fits



Enclosed Volumes
Check Valve Cross Section



High Precision, Flat - Scoreboard
Panel Clips

In Summary

STEP Delivers AM Parts with IM Fidelity and Properties

- Build for production
- Real Engineering Thermoplastics
- Separate Deposition and Fuse
- Multi-Engine Co-Printing
- Small Particles, Thin Layers
- Temperature, Pressure, Cooling



*Enabling a seamless journey from **Prototype** through **Production***



Case Study // Just-In-Time Manufacturing with Production Grade Thermoplastics

Customer Industry

Electric Vehicle

Customer Need

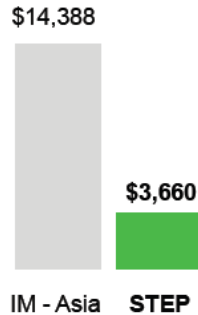
Urgent requirement for 600 ABS trunk safety cover assemblies

Results

Manufactured & shipped 360 parts in 1 week (5 working days) and 600 pcs in 2.5 weeks



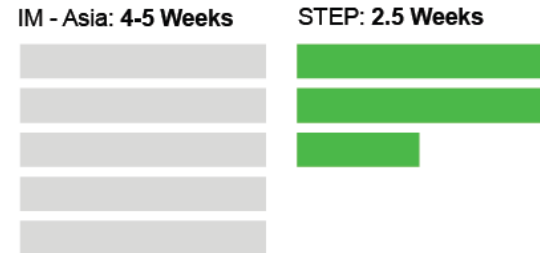
**Note: part displayed is an example and not actual customer part



Total Project Cost
~75% Improvement



First Delivery (T0) Lead Time
~67% Improvement



Full Project Lead Time
50% Improvement

Additional Value Provided

- Production Ready: STEP ABS parts conformed to customer production requirements (PPAP + Cpk).
- Eliminated need for costly tooling design changes.

Case Study // Quick-Turn Manufacturing Aids – Production Fixtures

Customer Industry

Fortune 100
Consumer Electronics

Customer Need

Urgent requirement for 3,040
ABS manufacturing aids
(fixtures)

Results

Fathom manufactured 3,040
parts in 3 weeks (14 working
days) and shipped to 5
worldwide locations



**Note: part displayed is
an example and not
actual customer part



Total Project Cost
Competitive with IM

IM - Asia: 3-4 Weeks



STEP: 3 Days



First Delivery (T0)
Lead Time
~80% Improvement

IM - Asia: 5-6 Weeks



Full Project Lead Time
50% Improvement

STEP: 3 Weeks



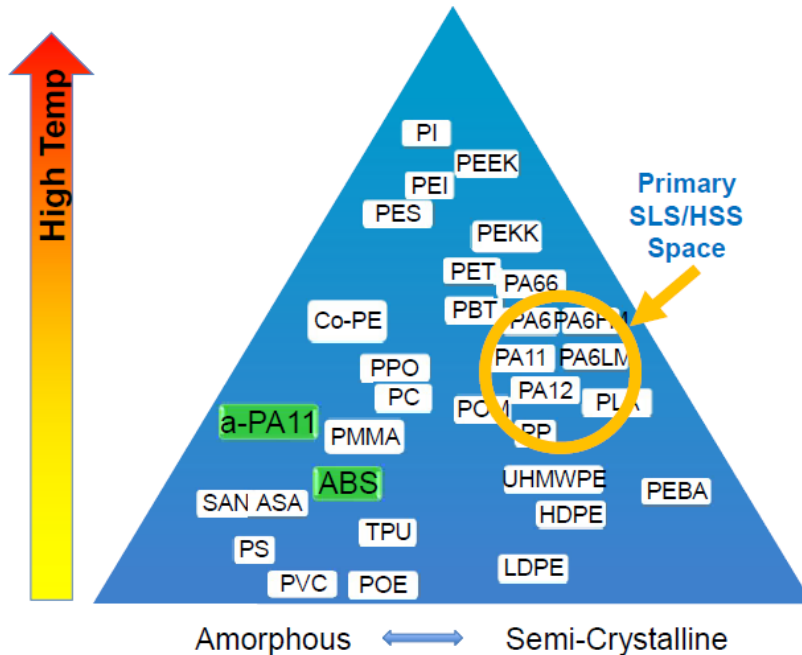
Additional Value Provided

- Production grade Thermoplastics: STEP ABS parts are more durable than current customer solution.
- Allowed for revision changes (what became necessary). Eliminated need for lengthy tooling design changes.

What's Next for STEP?



STEP Enables Broadest Engineering Thermoplastic Range



Today in Market

- ABS
- Amorphous PA-11

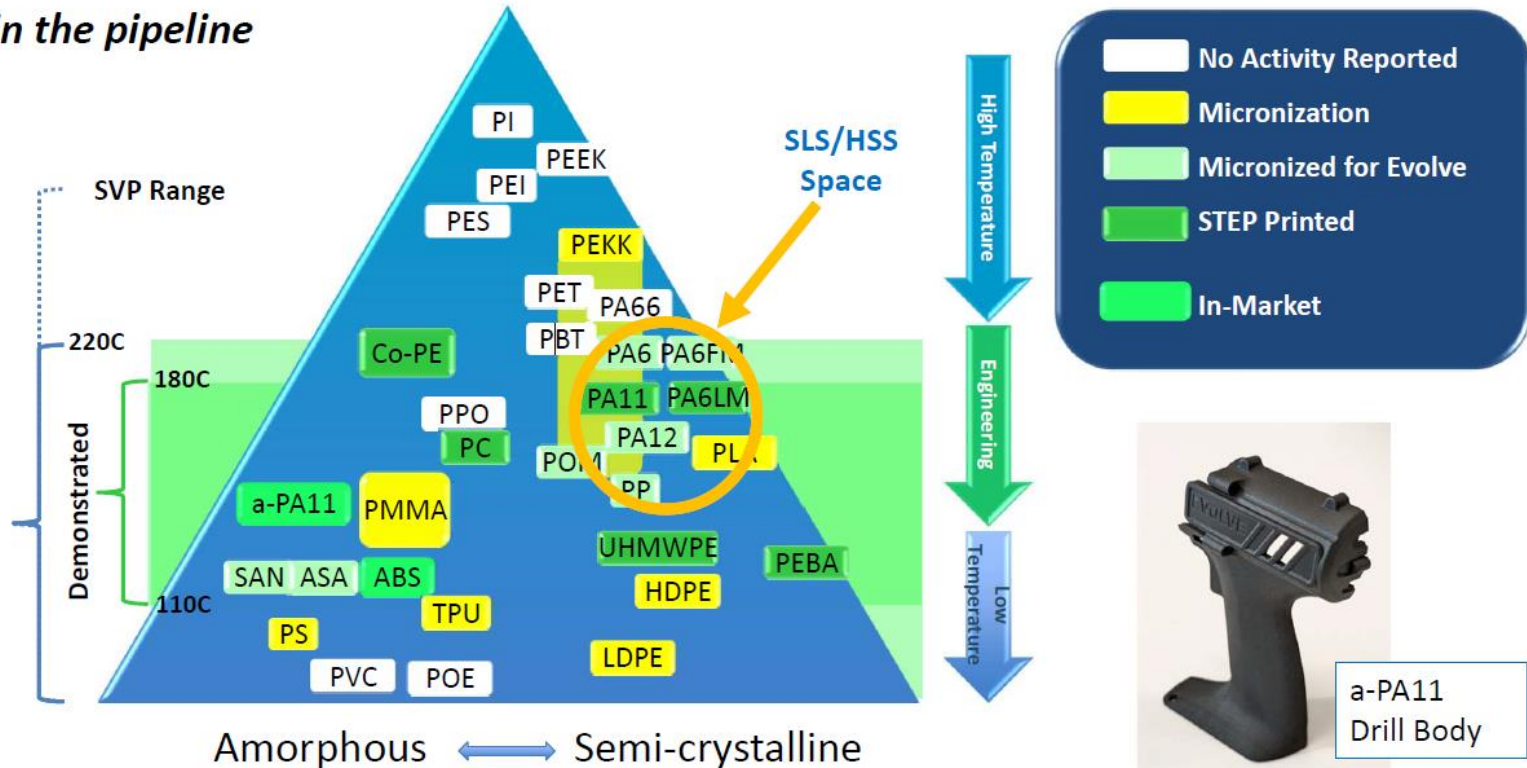
But we are just beginning the materials journey ...

Several unique materials progressing through R&D

STEP Has The Broadest Polymer Range in 3D Printing

Materials in the pipeline

- POM
- PC
- PA6



Recent Advances

EVOLVE

Bright Multi-Color parts



Smooth
Plated Parts



Hard-Soft co-printed
Multi-material Parts



Demonstration
of UHMWPE



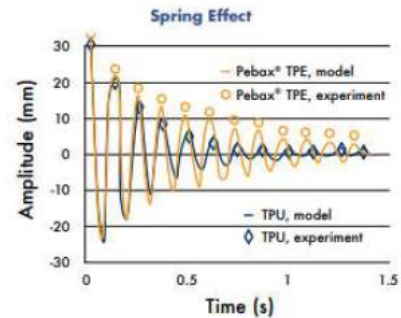
PEBAX





EXCEPTIONAL ENERGY RETURN

Pebax® resins have the lowest energy loss factor of all thermoplastic elastomers, with the best energy return and an unbeatable flex fatigue resistance. In fact, the shoes worn by all medalists in the marathon event in Rio De Janeiro contained Pebax® elastomers.



Evolve TPE (PEBAX Elastomer)

- Historical development sponsored by Fortune 500 shoe and athletic wear company
- Material was chosen specifically based on the industry leading choice for injection molded mid-soles
 - Arkema Rilsan 35R53 PEBAX: *Best rebound available, 29% renewable carbon*
- Very successful development brought to proof of concept (stopped because of customer budget issues)
- Evolve is free to pursue with other partners.

Printed parts demonstrate full density and performance ~ 95% of pure injection mold grade polymer

STEP printed PEBAX will have a **significant advantage over all other 3D printed elastomers:**

- Rebound
- Tear strength
- Seamless Prototype to Production Journey

<u>STEP printed</u>	<i>IM compare</i>
• Hardness: 85-88 Shore A	80-83
• Elongation to Break: >300%	>300%
• Rebound:* 61-63%	66%

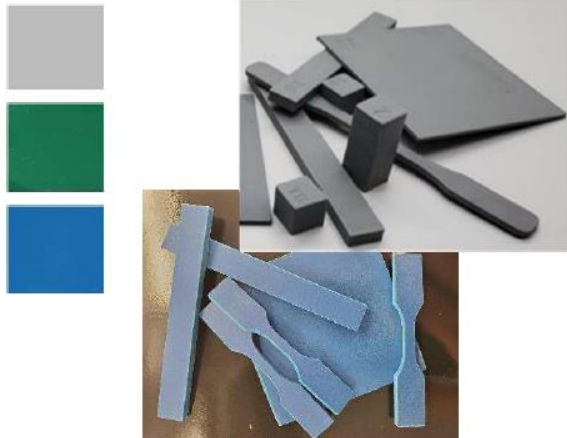
Bright Colors and Adjacent Heating

- Wide range of colors with standard process
- Bright colors with 'adjacent heating' technique



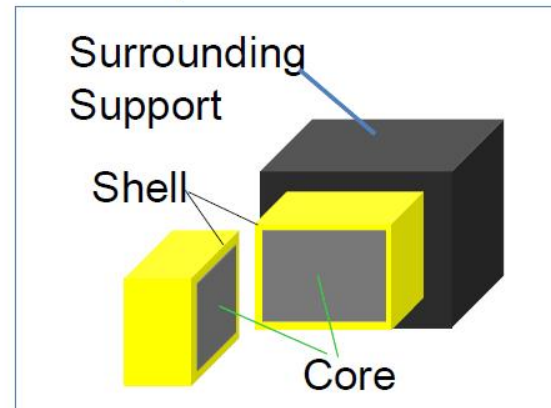
Solid Part Color:

Some IR absorption needed



Adjacent heating:

No IR absorption needed



Adjacent heating penetrates ~0.5-1mm

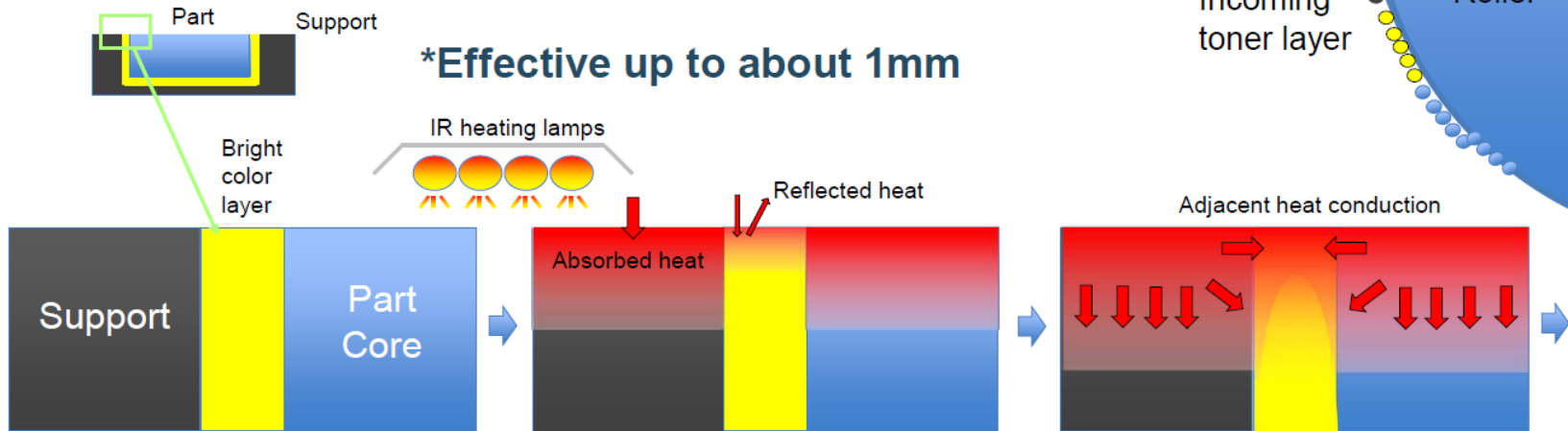


Shell example using support as core



Semi-transparent parts

Adjacent Heating - Concept



***Effective up to about 1mm**

Build surface with bright color shell

Build absorbs IR heat
 → Bright color reflects IR heating and is below Target temperature

Heat conduction from adjacent part core and surrounding support heats color shell

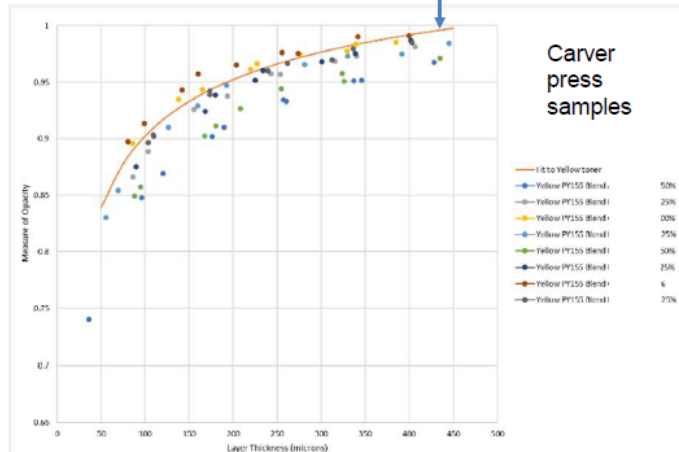
→ Color layer reaches desired temperature before entering Transfuse nip

Shell Thickness – Yellow Demonstration

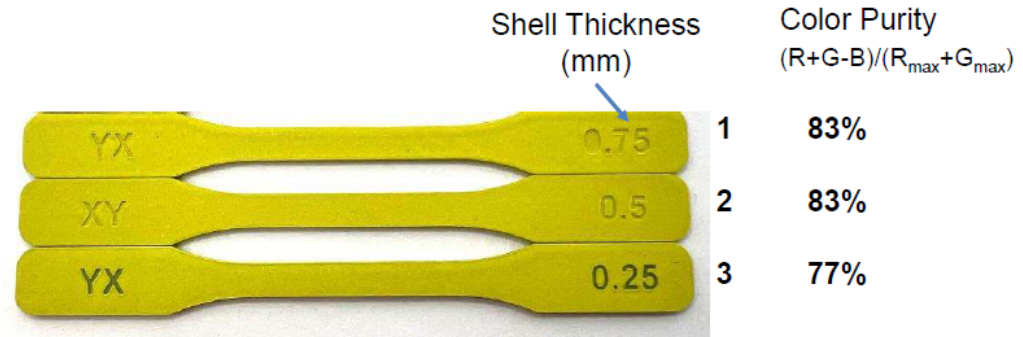
With moderate levels of TiO₂ (~2-3%), a 0.5mm layer is expected to **completely mask** the core material color

→ Yellow core-shell STEP printed samples confirm this

Opacity = 100% at 450µm



Dog bone color does not change at or above 0.5mm



STEP printed Core-shell parts

Q&A !?!


3D Printing for Production @ alphacam

Projects now available at TEILEFABRIK

STARKE PARTNER



SPEZIALISTEN



- über 30 Jahre Erfahrung
- Beratung, Installation
Musterbearbeitung,
Schulung, usw.

CAD/CAM



Lösungen für

- Werkzeug- und Formenbau
- Drahterosion
- spanabhebende
Teilefertigung

PRÄSENTATIONSCENTER



- europaweit größte
Ausstellung von Stratasys-
Produktionsanlagen
- Produktbeispiele

AFTER SALES KONZEPT



- Wartungsverträge
- eigenes Materiallager
- Direct Repair Center

TEILEFABRIK / fabberhouse



- großer moderner
Maschinenpark – mehr
als 60 Industrie-3D-
Drucker
- Finishing

QUALITÄTSMANAGEMENT



- zertifiziert
DIN EN ISO 9001:2015
DIN EN 9100:2018



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<https://www.alphacam.de/unternehmen/veranstaltungen>

STEP - Projekte ab sofort: [teilefabrik.de/anfrage](https://www.teilefabrik.de/anfrage)

WIR SIND ALPHACAM



kompetent



nachhaltig



erfahren



umfassend



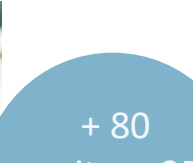
ehrlich



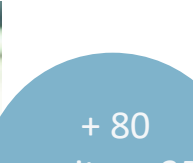
engagiert



freundlich



zuverlässig



+ 80
weitere 3D
Enthusiasten