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MAKING ADDITIVE REAL

JEC WORLD 2023
The Leading International Composites Show
April 25-27, 2023 | PARIS-NORD VILLEPINTE



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CMS SpA

LFAM BY CMS GETS BETTER AND BETTER, MAKING COMPOSITE PRODUCTION MORE COMPETITIVE AND SUSTAINABLE

- COMPANY PROFILE
- CMS KREATOR
- LFAM FOR COMPOSITE MANUFACTURING
- GREATER SUSTENAIBILITY CERTIFIED
- CUSTOMERS SAY
- CONCLUSIONS
- Q&A

AGENDA

SCM GROUP



GROUP FIGURES ARE STRONG AND RELIABLE

€ 700+ million in consolidated turnover

4.000+ people in Italy and abroad

3 main production centres

5 continents with a direct and capillary presence

7% of turnover invested in R&D



INDUSTRIAL MACHINERY

Stand alone machines, integrated systems and services dedicated to the processing of a wide range of materials.

scm — Woodworking technologies

Cms — Technologies for **advanced materials**, plastic, stone, glass and metals processing

INDUSTRIAL PARTS

Technological components for Group and third party machines and plants and for the mechanical industry

HITECO — Electro-spindles and technological components

es — Electrical panels

steelmec — Metalworking and mechanical machining

scmfonderie — Cast Iron

COMPANY PROFILE

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CMS ADVANCED MATERIALS

CMS ADVANCED MATERIALS TECHNOLOGY









HIGH SPEED AND BEST-IN-CLASS ACCURACY 5-AXIS CNC MACHINES FOR COMPOSITES, ALUMINUM AND METAL

CMS Advanced Materials Technology works with companies and research centers where **efficiency, versatility and high quality performances** are indispensable requirements. CMS machines respond to the needs in extremely demanding sectors, such as :

- **automotive**
- **aerospace**
- **Formula 1 & motorsport**
- **railway industry**
- **race boats**

CMS ADVANCED MATERIALS TECHNOLOGY

PRODUCT RANGE



1. Monobloc CNC machining centers **for vertical milling**
2. Monobloc CNC machining centers **for horizontal milling**
3. Gantry CNC machining centers **for large-size work areas**
4. Solutions **for Additive Manufacturing**
5. CNC machining centers **for the eyewear industry**
6. **Fixed and mobile bridge** CNC machining centers
7. CNC machining centers **for wind blade working systems**
8. CNC machining centers **for gunstocks processing**



Developed in cooperation with

Fraunhofer IWU

CMS KREATOR

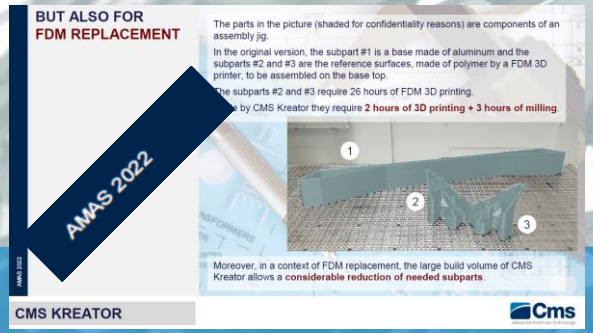
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COMPANY PROFILE

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STILL YOUNG BUT GROWING FAST











SELECTION OF **EVENTS** FROM THE LAUNCH

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CMS KREATOR

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Top Additive Manufacturing & 3D Printing News

‘Pushing the limits of innovation’ - 3D printed footwear showcased by Dior at Paris Fashion Week



After the 3D printed BOTTER x Reebok Venus Comb Murex Shell Sneaker was presented at Paris Fashion Week, a set of 3D printed shoes from Dior were showcased as part of the Dior Winter 23 by Kim Jones show.

READ MORE

24 JAN 2023



Northrop Grumman Brings Carbon Fiber 3D Printing to the Hypersonics Arms Race

The U.S. is in the midst of a hypersonics arms race. Craft traveling five times or more the speed of sound in a guided way could change warfare. In a…

January 25, 2023 • by Joris Peels

Aidro to supply Leonardo Helicopters with aluminum 3D printed flight parts



Source: JEC Composites; 3D Printing Media Network; TCT Mag; 3D PRINT.COM..

CONTEXT OF **STRONG** TECHNOLOGY AND MARKET **GROWTH**

STILL YOUNG BUT GROWING FAST





MOREOVER

- INCREASED HARDWARE **ROBUSTNESS**
- INCREASED **ACCURACY** IN MATERIAL DEPOSITION
- ENLARGED USABLE **MATERIALS PORTFOLIO**
- MORE IN DEVELOPMENT…

ALSO CMS KREATOR GETS **BETTER AND BETTER**

CMS KREATOR

STILL YOUNG BUT GROWING FAST

- NEW SOLUTIONS FOR **LARGE BUILD VOLUMES** AND LARGE **MASS FLOW**

THE NEW SOLUTION FOR 3D PRINTING ONLY WITH LARGE BUILD VOLUMES AND LARGE MASS FLOW



KEY BUYER BENEFITS

- Extruder mass flow up to 100 Kg/h
- Very large build volumes
- Range with 6 models/sizes: from 40/30 Z2000 to 40/105 Z2000
- 3 possible 3D printing strategies: 0° (vertical), 45°, 90° (horizontal)
- The easiest way on the market to change 3D printing strategy (see table on the right)

EXTRUDER TILT	KIND OF NOZZLE	POSSIBLE 3D PRINTING STRATEGY
0° - Vertical	0° - Vertical	0° - Vertical
	45°	45°
45°	0° - Vertical	45°
	45°	90° - Horizontal

JEC WORLD 2023 – CMS KREATOR NEWS

KREATOR MX5 OF 100 40/XX Z2000

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THE NEW HYBRID SOLUTION FOR 3D PRINTING AND MILLING WITH LARGE BUILD VOLUMES AND LARGE MASS FLOW

The **same beam** of Kreator MX5 OF 100 can be installed on **Poseidon 40/XX Z2000 Double Bridge**, to get both **Large Format Additive Manufacturing** and **Milling**.



KEY BUYER BENEFITS

- 3D printer fully integrated in a large-sized 5-axis CNC portal.
- Extruder mass flow up to 100 Kg/h
- Very large build volumes
- Range with 3 models/sizes: from 40/75 Z2000 to 40/100 Z2000
- 3 possible 3D printing strategies: 0° (vertical), 45°, 90° (horizontal)
- The easiest way on the market to change 3D printing strategy (see table on the previous slide)

KREATOR POSEIDON 100 ADDB 40/XX Z2000

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THE NEW HYBRID SOLUTION FOR 3D PRINTING AND MILLING WITH LARGE BUILD VOLUMES AND SMALL MASS FLOW

The **same extrusion system** of Kreator Ares can be installed on a **Poseidon**, to get both **Large Format Additive Manufacturing** and **Milling**.



KEY BUYER BENEFITS

- 3D printer fully integrated in a large-sized 5-axis CNC portal.
- Extruder mass flow up to 10 Kg/h
- Very large build volumes
- Range potentially including all Poseidon models/sizes
- 3 possible 3D printing strategies: 0° (vertical), 45°, 90° (horizontal)
- The change of function from 3D printing to milling and vice-versa is fully automatic.

KREATOR POSEIDON 10 ADDE

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ALSO CMS KREATOR GETS **BETTER AND BETTER**

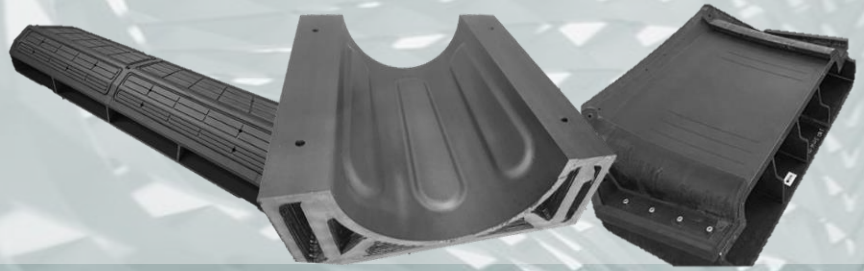
IT CAN BE USED TO MANUFACTURE

TOOLINGS

- MACHINING JIGS
- LAMINATION MASTERS
- DIRECT MOLDS

OTHER APPLICATIONS

- IN A CONTEXT OF EPOXY UREOL (OR SIMILAR) REPLACEMENT
- IN A CONTEXT OF FDM REPLACEMENT





Source: CMS; MDC DESIGN; JEC Composites.

SOME EXAMPLES OF 3D PRINTED TOOLINGS FOR COMPOSITES



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formnext

International exhibition and conference on the next generation of manufacturing technologies
Frankfurt, Germany,
15 – 18 November 2022

#	PART	DIMENSIONS (mm)	WEIGHT (Kg)	MATERIAL	3D PRINT STRATEGY	KREATOR BASE	EXTRUDER (Kg/h)
1	LAM. MASTER	1300 x 800 x 460	90	ABS CF	90°	ARES	10
2	MOLD	2800 x 1800 x 1000	500	ABS CF	45°	POSEIDON	100
3	JIG	1200 x 400 x 350	26	ABS CF	45°	ARES	10
4	MOLD	300 x 300 x 350	10	PEI CF	VERTICAL	ARES	10

④



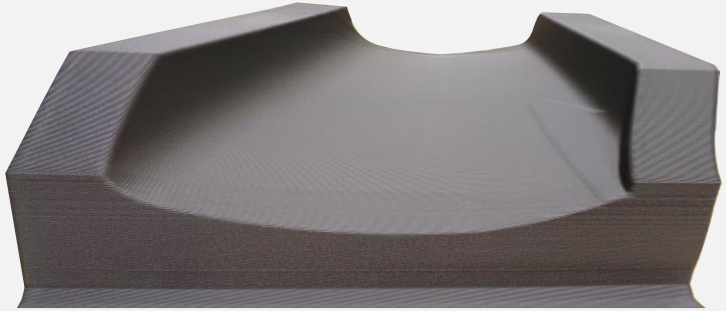
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①



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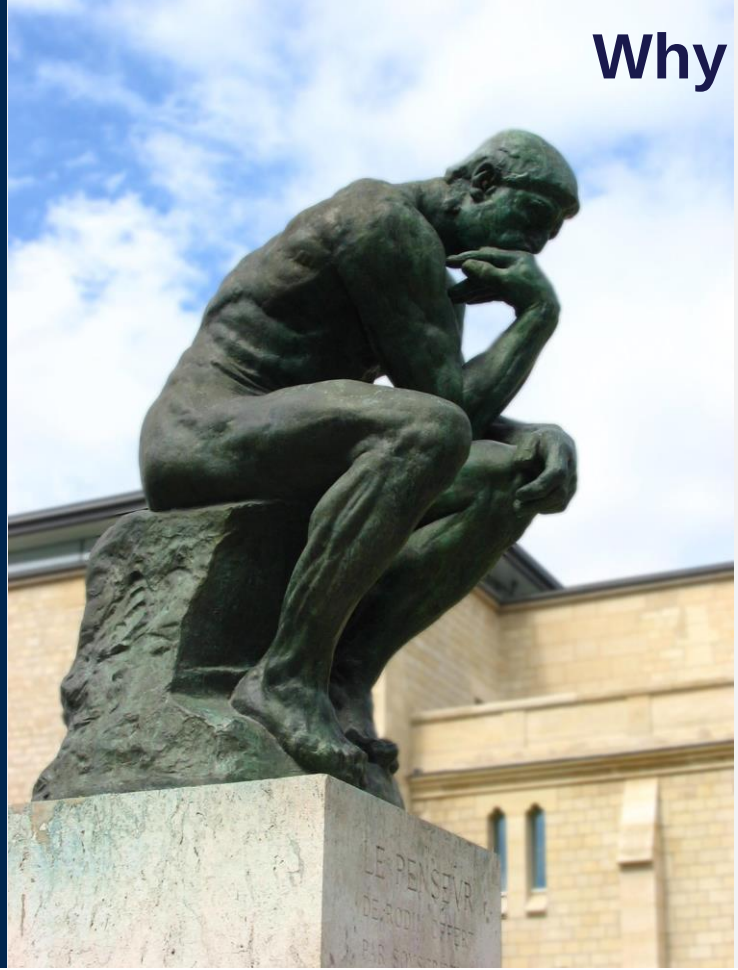


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LFAM FOR COMPOSITE MANUFACTURING

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Why direct molds for composites?



PROS

- Shorter manufacturing process.
- Material saving.
- Energy saving.

CONS

- Dimensional compensation required.
- Anisotropy.

THREE EXAMPLES

1. Direct mold for UHF table's calibration GFRP sheet.
2. Direct mold for CFRP competition car seat.
3. Direct mold for CFRP UAV wing.

1 – 3D PRINTED AND MILLED DIRECT MOLD FOR UHF TABLE'S CALIBRATION SHEET

Features:

- Material: AKROMID B3 ICF40 - PA6/CF40
- Dimensions: 2100 x 1850 x 700 mm
- Weight: 220 Kg
- 3D printing time: 55 h
- 3D printing average speed: 14 m/1'
- Milling time: 11 h

SAVED MATERIAL: 83,4%





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International exhibition and conference on the next generation of manufacturing technologies
Frankfurt, Germany,
16 – 19 November 2021

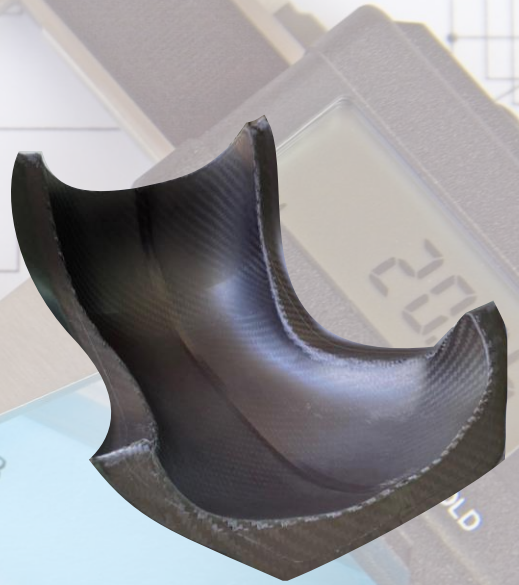
2 – DIRECT MOLD FOR CFRP COMPETITION CAR SEAT.

Features:

- Material: DAHLTRAM I-250 CF - PC/CF20
- Dimensions: 870 x 640 x 400 mm
- Weight: 40 Kg x N° 2 subparts
- 3D printing time: 7 h 12’ x N° 2 subparts
- 3D printing average speed: 5 m/1'
- Milling time: 20,5 h x N° 2 subparts

SAVED MATERIAL: 76%





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May 3-5, 2022
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Courtesy of:: DYNAMIΣ POLIMI REPARTO CORSE

3 – DIRECT MOLD FOR CFRP UAV WINGS.

Features:

- Material: DAHLTRAM I-250 CF - PC/CF20
- Dimensions: 1233 x 260 x 792 mm
- Weight: 59 Kg
- 3D printing time: 9 h
- 3D printing average speed: 5 m/1'
- Milling time: 25,5 h

SAVED MATERIAL: 74%





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PARIS-NORD VILLEPINTE
May 3-5, 2022

JEC WORLD
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Courtesy of:: UNITED AEROSPACE LTD



Source: RINA SpA

DOES LFAM REALLY HELP SUSTANAIBILITY?

- We know that LFAM **reduces** the use of **material**.
- But, in a holistic view, what about the **overall environmental impact** of a **process using LFAM**?

CMS has commissioned the well-known consulting company **RINA** a study focused on **direct molds for CFRP**, 3D printed and milled by **CMS Kreator**.

EXECUTIVE SUMMARY

This document represents the **LCA report** containing the results of the analysis performed for C.M.S. S.p.A. The work consisted of a comparative analysis of two different manufacturing processes to produce molds, i.e., a business-as-usual process and an innovative process based on additive manufacturing.

The LCA study was carried out in accordance with the internationally recognized ISO 14040:2021 and ISO 14044:2021 standards. The functional unit against which the results of this study were reported is "production of mold(s) to obtain 250 pieces per year".

The analysis was performed using a **cradle-to-grave approach**, thus considering:

- raw material extraction and processing;
- transport of goods (i.e., raw materials and products);
- manufacturing steps, including provision of all materials, products, and energy, as well as waste processing up to the end-of waste state or disposal of final residues;
- end-of-life stages for the materials involved in the process.

RINA

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COMPARATIVE LCA
DEFINITION OF THE PROCESS



Source: RINA SpA

Traditional method

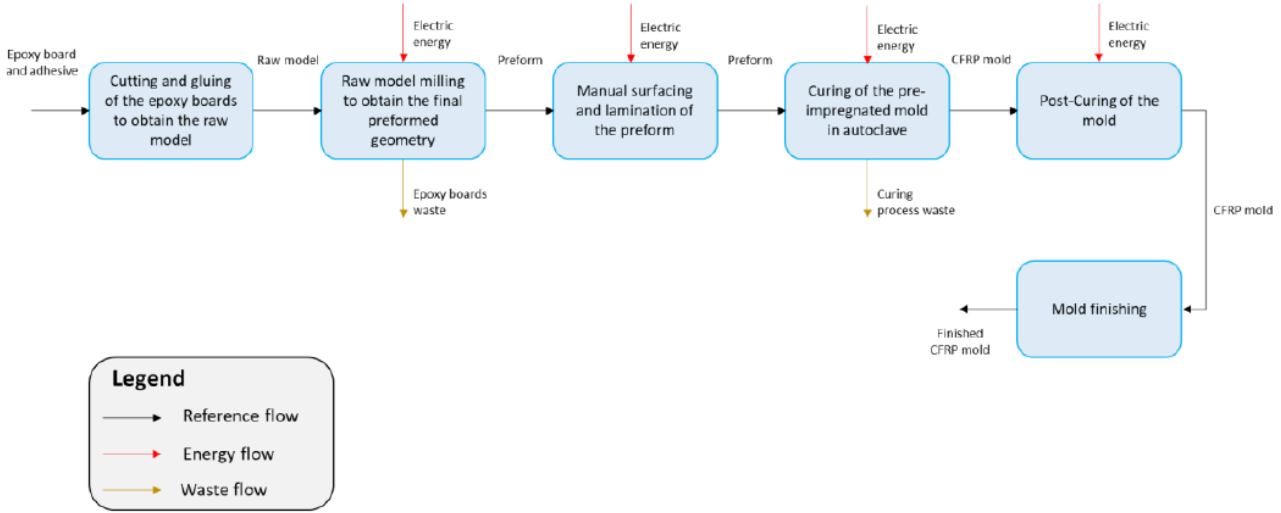
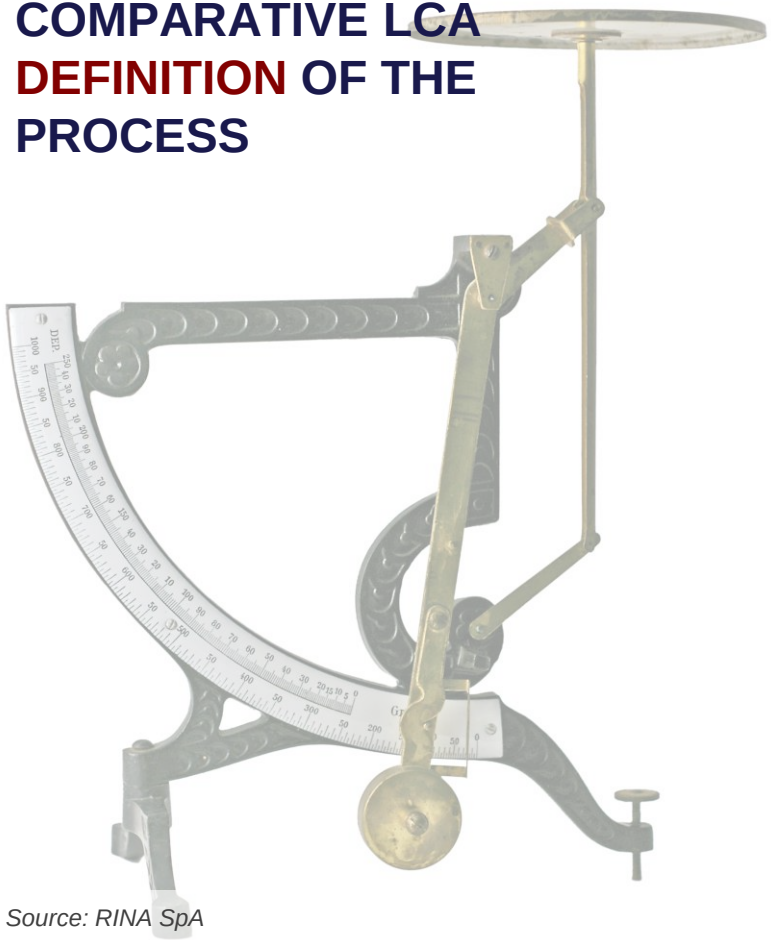


Figure 5: System boundaries of the business-as-usual process

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COMPARATIVE LCA DEFINITION OF THE PROCESS



Source: RINA SpA

Innovative method (using **CMS Kreator**)

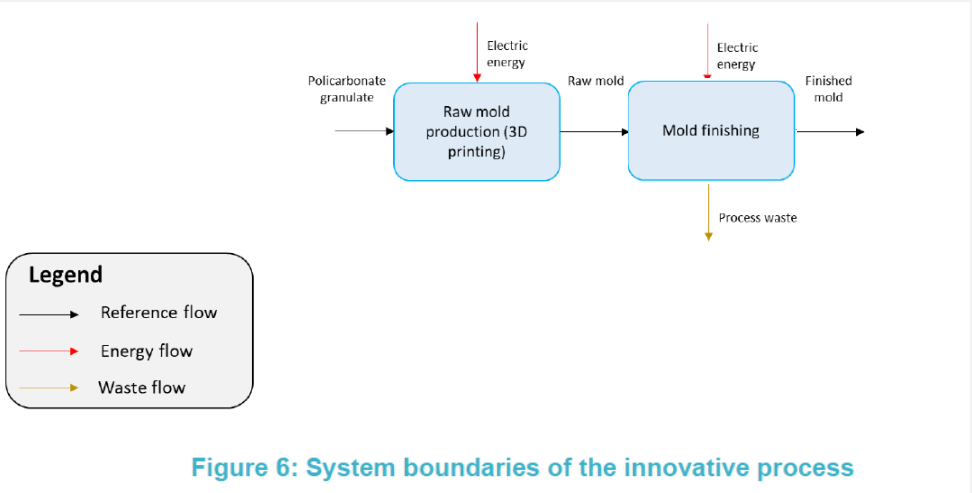


Figure 6: System boundaries of the innovative process

GREATER SUSTENAIBILITY CERTIFIED

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COMPARATIVE LCA RESULTS

The results are really interesting.

The **production process** using LFAM **reduces** the environmental impact **by 55%** and **if we consider the recycling** of the product, **the reduction** in environmental impact **is more than 60%**.

The **greater sustenaibility** of processes using **CMS Kreator** is **certified**.



Source: RINA SpA

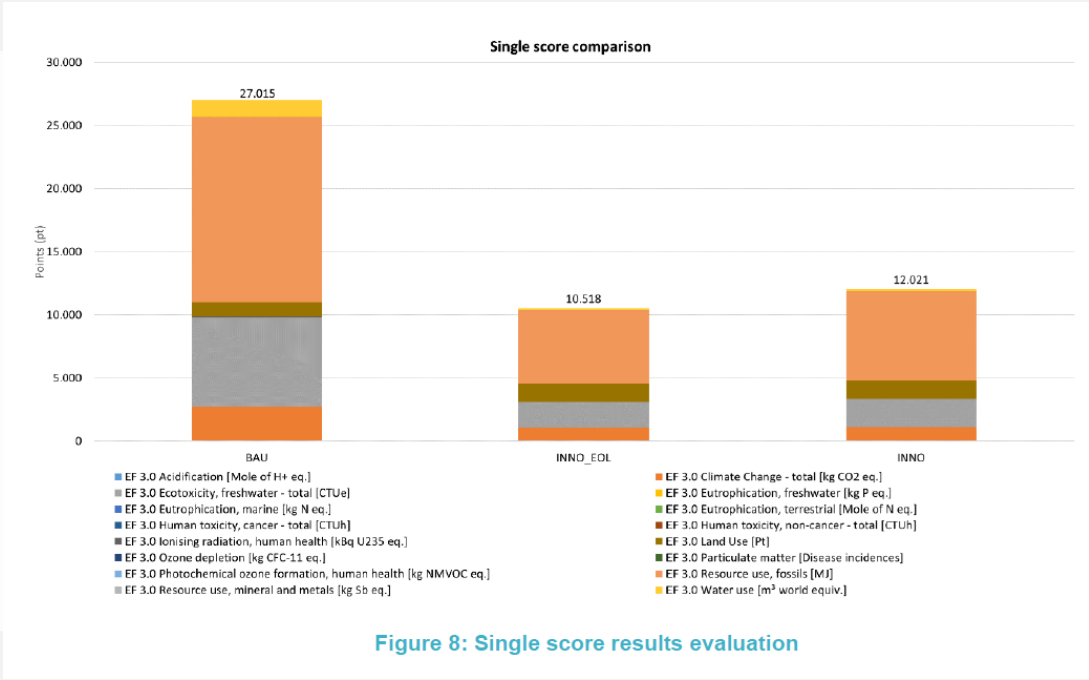
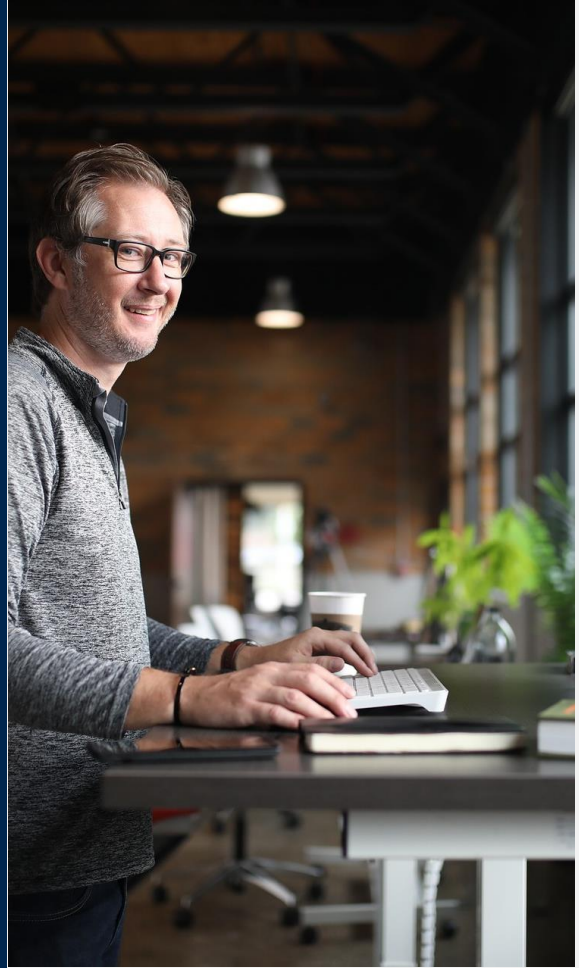


Figure 8: Single score results evaluation

GREATER SUSTENAIBILITY CERTIFIED

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FINALLY, ARE CUSTOMERS APPRECIATING?

- To boost the communication about CMS Kreator, we arranged several “Additive Talks” on YouTube.
- One of these was with one of the first customers.



- After one year, we **assessed** with him **the results**.

CUSTOMER SAY

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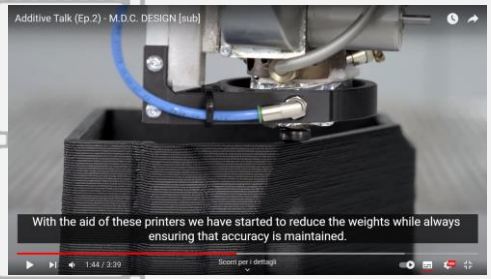
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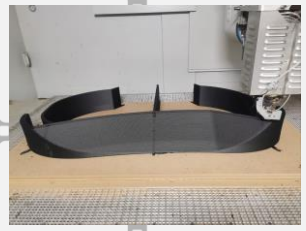
"The customer ask us to **reduce the weights** of the equipment."

"With the aid of these printers **we have started to reduce the weights** while always ensuring that **accuracy is maintained**."

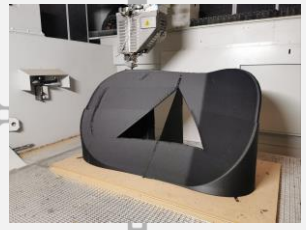
CUSTOMER SAY

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2023

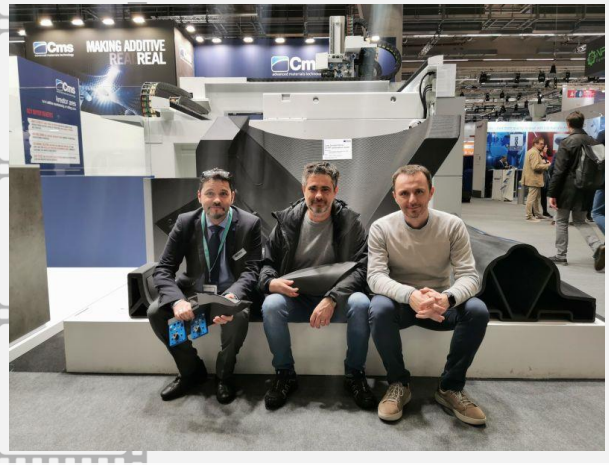












Source: M.D.C. Design

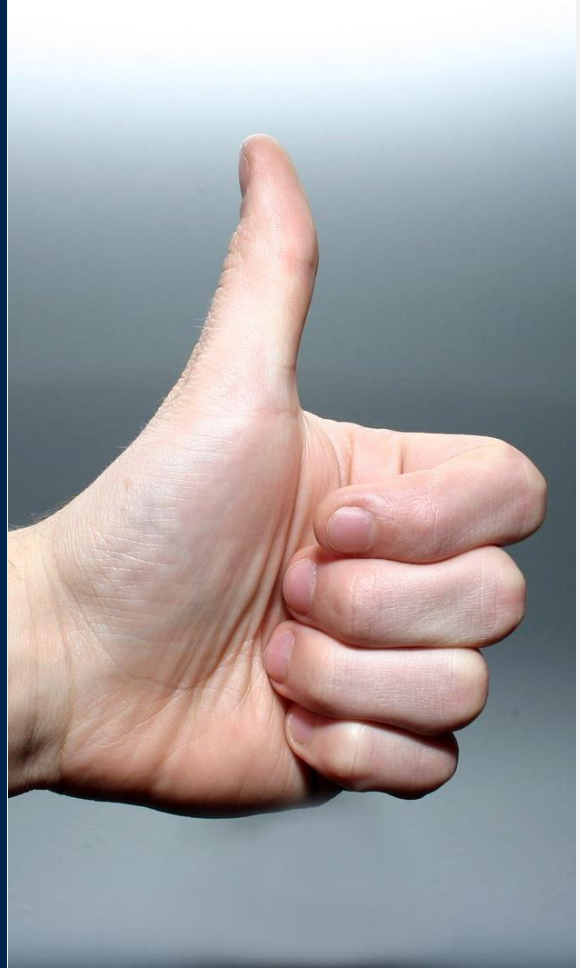
"… CMS and M.D.C. committed themselves to **consolidate the technology** and, for some months, we can say that **we have been using Kreator in a much more industrial way** …"

"... **Kreator is used** in our manufacturing of parts for customers **like the other machines** we have and **it provides in addition** the **benefits of additive manufacturing** ... All this while **maintaining the required accuracy**, as I already told you a year ago ..."

"… we have manufactured some workpieces for processes and customers not typically "ours" (in particular one in the Aerospace sector), and **we can see a potential for extending the application areas** …"

CUSTOMER SAY

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MAKING IT REAL

- ✓ **HIGH FLEXIBILITY:** INTEGRATION OF A LARGE FORMAT 3D PRINTER WITH A MACHINE TOOL, ABLE TO PRINT DIFFERENT TYPES OF MATERIAL IN DIFFERENT WAYS
- ✓ **MATERIAL SAVING:** UP TO 5 TIMES LESS MATERIAL COMPARED TO CURRENT MANUFACTURING TECHNOLOGIES AND UP TO 5 TIMES LESS MATERIAL THAN COMPETITORS
- ✓ **SUSTAINABLE SOLUTION:** FEWER SUBPARTS, LESS MANUFACTURING TIME AND LESS COSTS THAN LARGE SIZED FDM AND COMPETITORS
- ✓ **LOWER ENVIRONMENTAL IMPACT** CERTIFIED
- ✓ **INDUSTRIAL SOLUTION** ORIENTED BOTH TO THE APPLICATIONS OF THE TECHNOLOGY AND TO THE NEEDS OF THE USER

THANKS FOR YOUR KIND ATTENTION!

QUESTIONS?



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Q&A

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