

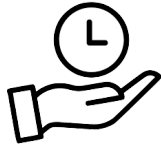
King Agro, a John Deere company.

Enhancing development and production efficiency with **KODAK 3D Printing**



99%

Cost Saving



62%

Time Saving



4 areas

**R&D, Production,
Maintenance,
Quality Control**



+15 parts

validated

within 15 days

(tools, jigs, prototypes)

King Agro is an international company part of the John Deere corporation. Leading the development and production of innovative, resistant and durable, self-propelled spraying equipment for agricultural machinery, applying Carbon Fiber technology. King Agro is the leading manufacturing plant in South America and Europe, with a production capacity of approximately 1000 spray booms per year.



The company works on improving the productivity of agricultural machines, relying on Carbon Fiber as the key factor to the innovation and progress of the agricultural sector worldwide. Quality and reliability of its machinery are the results of a philosophy of innovation, technical rigor, quality control and demand in the care of every detail.

OPTIMIZING THE MANUFACTURING LINE

In the continuous effort to improve production efficiency and cost reduction, the King Agro engineering team chose to adopt 3D printing as a versatile tool in order to rapidly validate and manufacture a great variety of parts, whilst improving the manufacturing process and reducing time and cost for parts, previously outsourced.



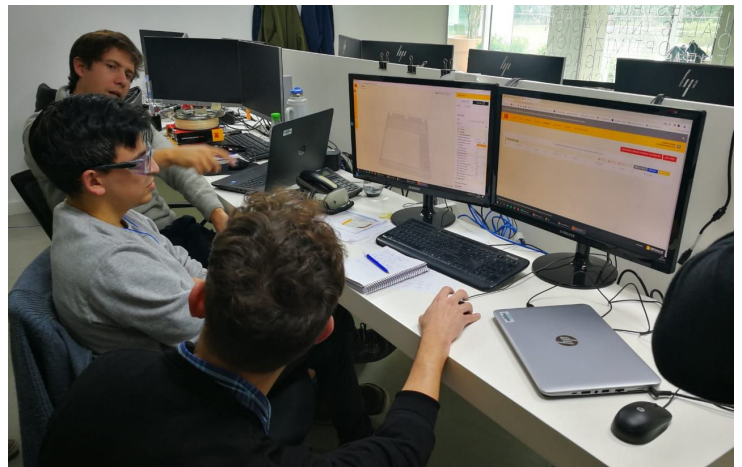
A list of different models and parts that needed to be manufactured was made, taking into consideration mechanical needs, materials to be used, previous manufacturing costs and lead time, etc. 3D printing was rapidly proven to meet the needs of flexibility and speed and easy implementation, at an extremely affordable cost.

On the left: King Agro manufacturing plant for South America.

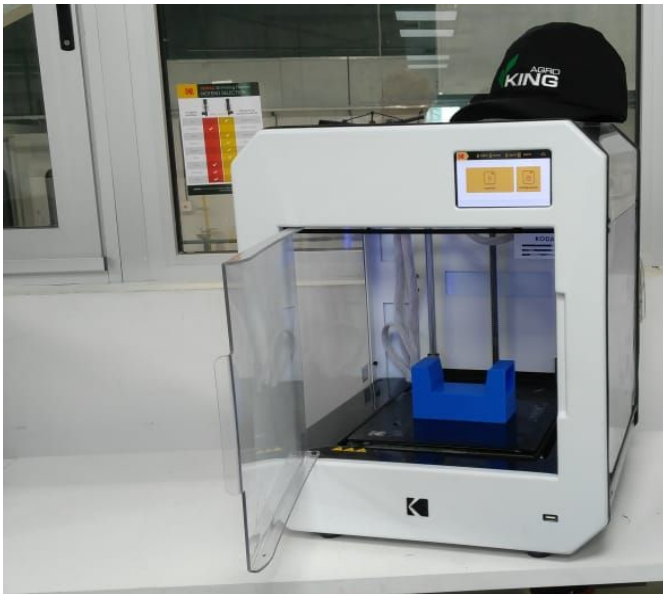
KODAK PORTRAIT | SPEEDING UP PRODUCTION

The KODAK 3D team worked in conjunction with King Agro's engineering team, enabling them to operate the KODAK Portrait 3D Printer. Some of their personnel already had 3D printing knowledge working with desktop machines which they used to print with PLA.

Even without having experience in other printing materials, which are proven to be more complex to print, they managed to start printing parts in engineering materials in a short time.



The KODAK Portrait allows for an easy setup and is specifically designed to print engineering materials such as ABS, Nylon or Flex in simple operations, offering reliable results with good tolerances.



Within the first ten days, engineers from different company departments were able to use the printer validate more than 15 different parts in a variety of engineering materials including **auxiliary tools, supports, jigs and prototype parts.**

The printer was proven successful in allowing engineers and designers of the team with little or no experience in 3D printing, to have a rapid learning curve, and obtain results in the printing of parts with engineering materials.

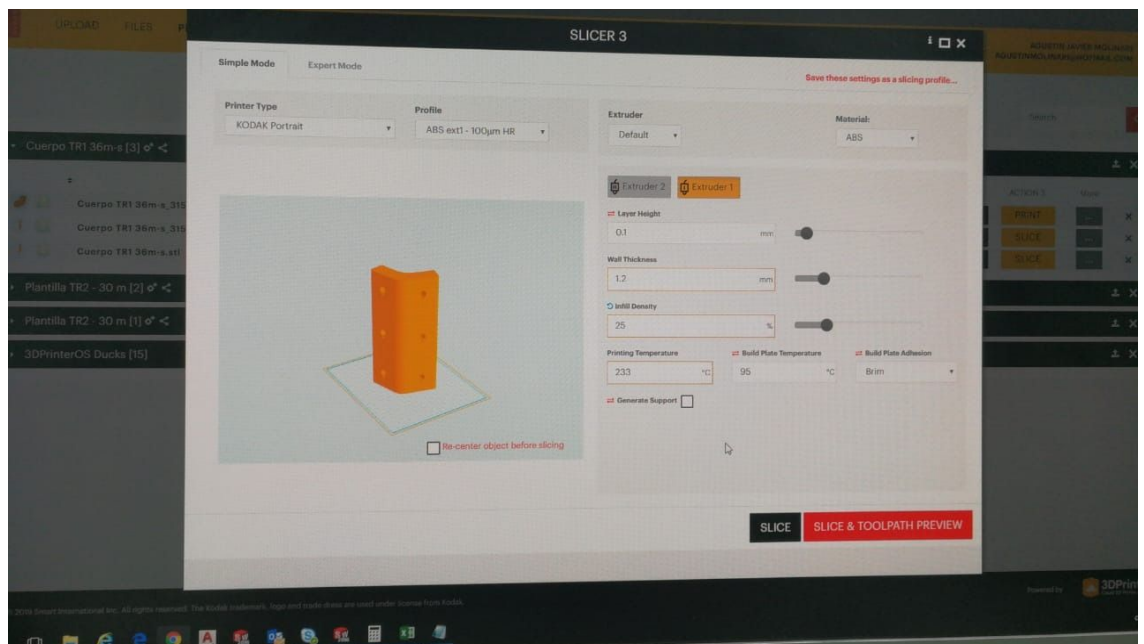
On the right: KODAK Portrait at the King Agro's technical department.

THE PROCESS | KODAK 3D SLICER

Printed models were prepared and sliced using the KODAK 3D Slicer with its material preset settings. Given the ease of use and the included profiles, the engineers only needed to position the model and select the desired material profile.

The printer and its tools proven to be successful in simplifying tasks and reducing times in the production of different models and parts.

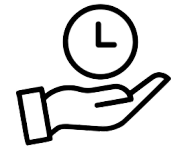
*KODAK 3D Printing solution includes tools such as the **KODAK 3D Slicer** with preset settings and the **KODAK 3D Cloud** connectivity functions to remotely monitor prints.*



Reducing implementation times of jigs and fixtures for the production line

PROJECT #1:

MANUAL DRILLING JIG



Safety and Quality Control Department

Jig to position holes to allow for high accuracy manual drilling operations

COST SAVING: 99.3% **TIME SAVING: 62.5%**

	CNC		3D PRINTING	
	Lead time (hrs)	Cost (USD)	Lead time (hrs)	Cost (USD)
1 unit	96 (per iteration)	750.00	18	5.00
6 units	288 (3 iterations)	4,500.00	108	30.00

The jig's function is to optimize safety and precision of the inline drilling process.

After being validated the jig was subsequently printed with the aim to reduce iterations to only 18hrs, The 3D printed part was proven to be a valid alternative for the metal part at a fraction of the original cost and manufacturing time.

THE PROCESS | KODAK MATERIALS

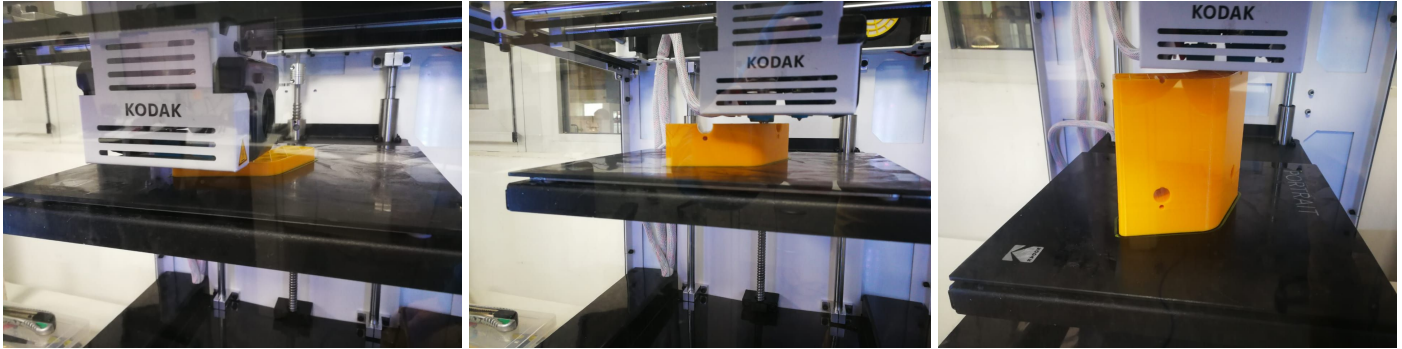
The design concept was validated by printing it with PLA+. To further reduce cost and increase strength, the final part was printed in ABS.



3D printed part vs CNC machined part.

THE RESULTS | COST AND LEAD TIME REDUCTION

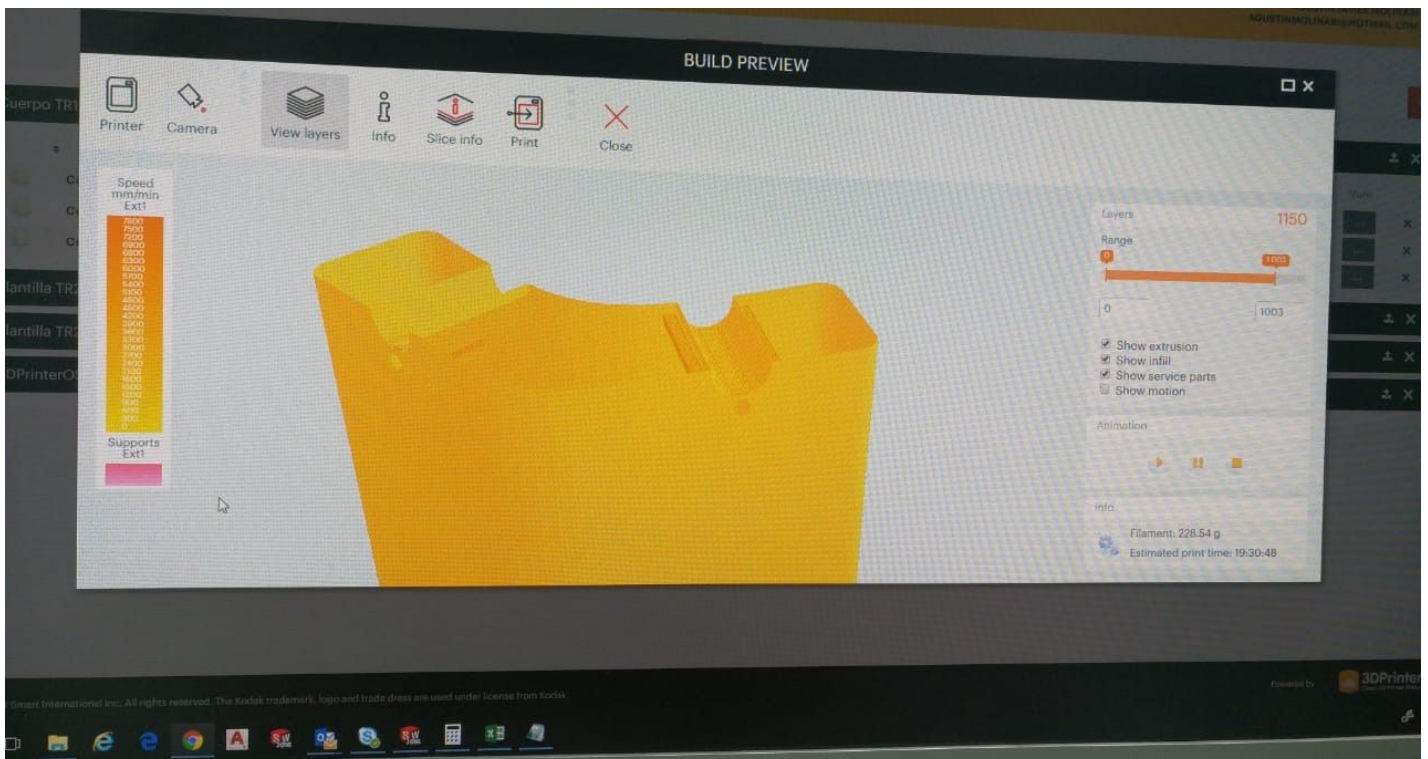
TIME



Part measures: 120 mm x 70 mm x 230 mm.

PRODUCTIVE TOOL	COST per unit	WORK PERFORMANCE	POST PROCESSING	LEAD TIME
3D PRINTING	USD 5	IN HOUSE	NONE	18 hrs
CNC MILLING	USD 750	EXTERNAL	DRILLING	96 hrs

After validating the model and the dimensional accuracy the jig was immediately ready to be used in the production line.





LOOKING FORWARD

Engineering materials are becoming more popular in the 3D printing industry, enabling companies to build parts that were not possible in the past. New 3D printing hardware and software development goes along with the materials, creating powerful ecosystems that raise the standards for industry.

Nowadays 3D printing technology allows engineers at King Agro to easily print with advanced materials to create different kinds of jigs and fixtures. Learning curves, previously complex, today require no more than a few hours in order to enable any engineering/design team to autonomously print parts in ABS, Nylon or Flex that were previously very difficult to manufacture.

From this point, the engineering team has moved onto devising new parts, that could not be manufactured previously. Thanks to the KODAK Portrait 3D Printer, these engineering parts are now available in a short time and at an extremely competitive cost.

OTHER 3D PRINTED MODELS

During the first week of use of the printer the team managed to print different kinds of parts in order to assist them in all the necessary tasks for workers at the production line. These parts included:



R&D: ACCELEROMETER SUPPORT - **KODAK PLA+ Prototype + LVM in ABS**

Support to hold an accelerometer in place to test weather resistance and durability for different boom profiles. The top has a plain surface with mating holes and the bottom part has a V block to center the part to the boom profile. The part is used to replace the flat accelerometer base, provided by the sensor manufacturer.

Around 12 accelerometers can be mounted during the process and several changes may be necessary during tests, this makes this part ideal for 3D printing as it can be replicated several times, including changes with almost no cost.

Proof of concept was validated with prototypes in PLA+. Final parts were printed in ABS since they required testing outdoors.



PRODUCTION: FIXTURE - **KODAK ABS**

CNC Fixture used to hold a carbon fiber part in place during the machining process. The part has a wall thickness of 5mm.



QUALITY: LASER HOLDER - **KODAK ABS**

Part designed to hold a laser pointer used to align parts, during the production process. The team quickly designed and printed this part which would have needed to be machined otherwise, this reduces costs and availability times significantly.



PRODUCTION: PART HOLDER - KODAK ABS

CNC Fixture to hold pieces in the same position while they are being machined. The offset between the real piece and the fixture can be modified and adapted with almost no effort, making this print something really useful in speeding up the productive process.

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About 3DGBIRE:

3DGBIRE are the UK and Ireland's premier professional 3D printing experts. We sell, service and support market-leading products and share our knowledge through professional training programs. Our mission is to help companies to integrate 3D printing into their business with ease and efficiency.

Our 360-degree service takes you from implementation to training and on to providing only the best local aftercare, we want to ensure our customers believe in our products like we do.