420127, Russia, Kazan,
1, Dementyeva str.

+7 (843) 204 75 05
info@kcdt.ru

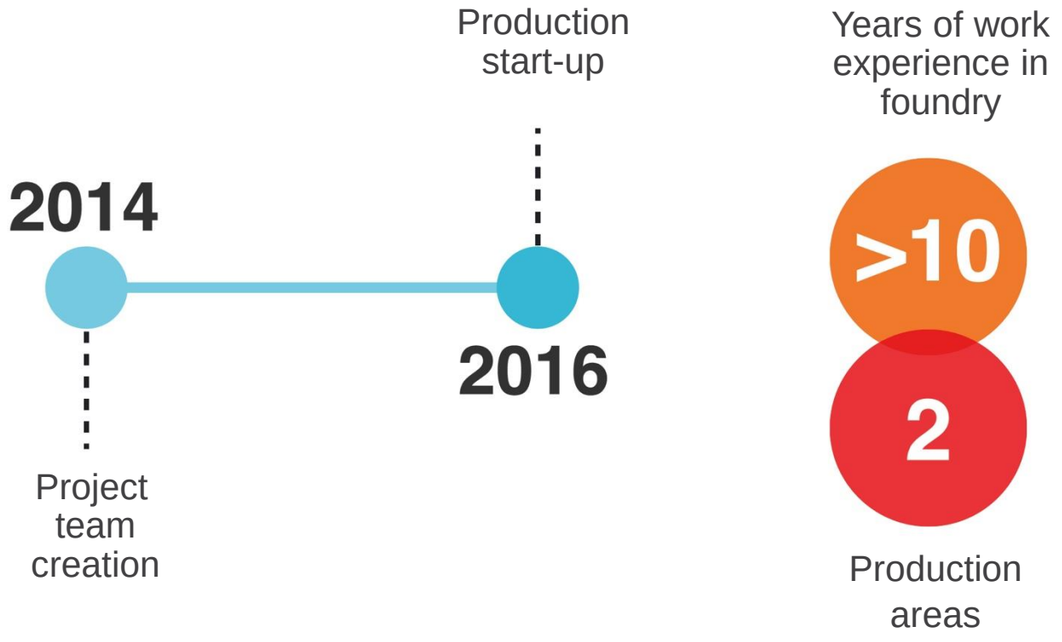
www.kcdt.ru

Centre of
Digital
Technologies

CONTENT

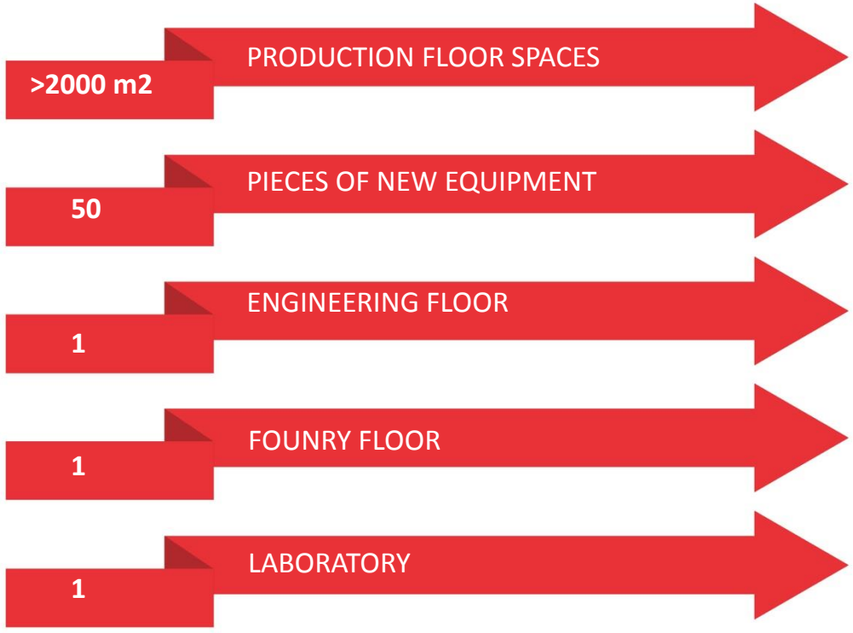
GENERAL INFORMATION

ENGINEERING CENTRE AND PROTOTYPING CENTRE



It originated from the SME support programs of the Ministry of Economic Development of the Russian Federation in accordance with the Decree of the Cabinet of Ministers of the Republic of Tatarstan dated November 24, 2014 No 900.

Products of Centre of Digital Technologies (CDT) are complex individual products for experimental work in conducting Research & Development, Design & Development, products of small and medium-sized series before introducing them into production to verify functionality and operational characteristics.



CONTRACTOR OF COMMERCIAL AND MILITARY ORDERS

- COMPUTING
- LABORATORY
- FOUNDRY
- SMELTING
- CLEANING
- THERMOFINISHING
- MOULDING
- MONITORING AND MEASURING

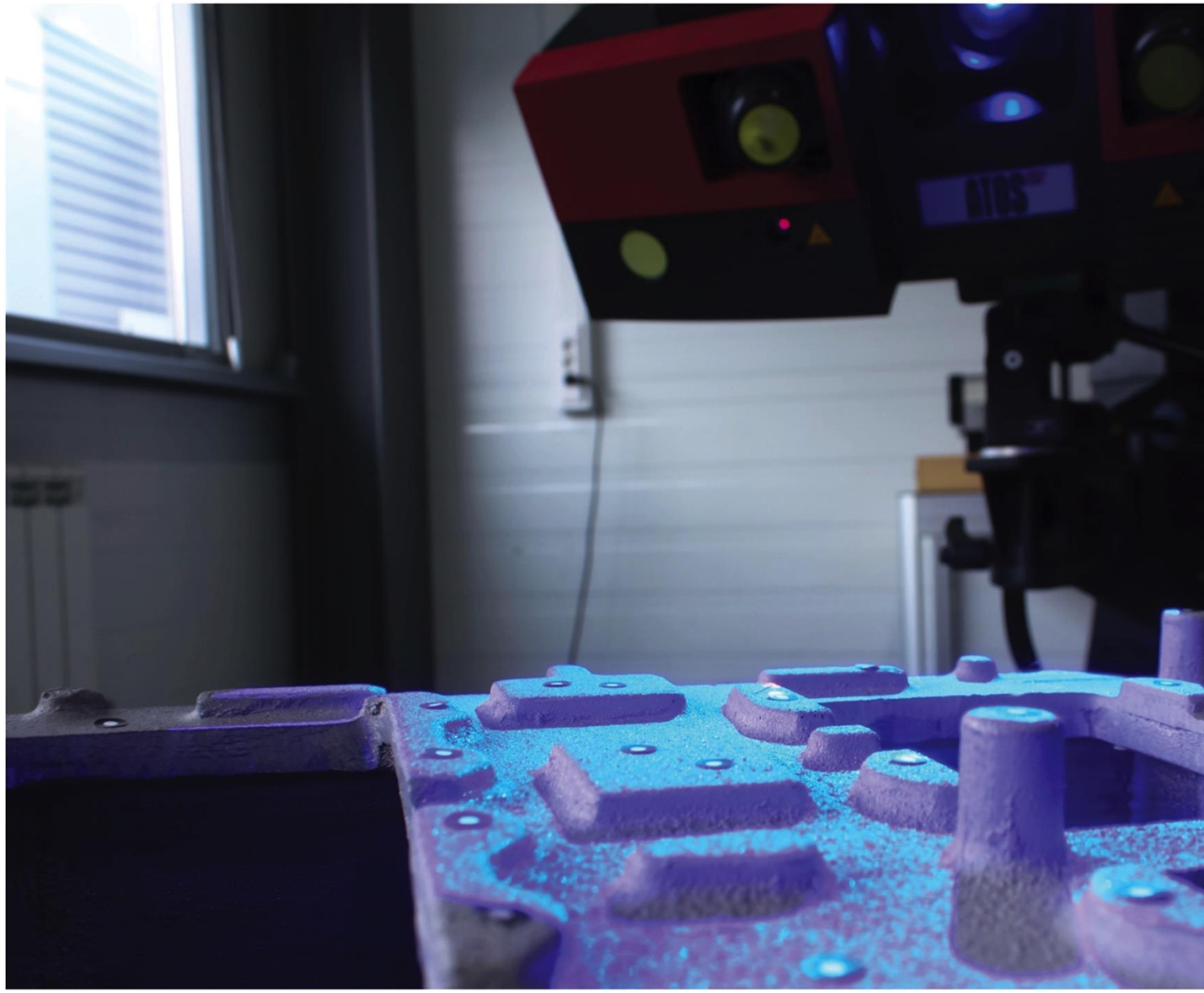
ATOS III TRIPLE SCAN XL

2 MK

Accuracy of digitizing
(0,002 mm)

USAGE:

- Analysis of deviations from the mathematical model
- Metrological control
- Interoperable control
- Wear analysis
- Reverse engineering
- Digital archiving



3D PRINTER S-MAX

SAND MOLD CREATION

- Printing of foundry and rod molds of any complexity
- Manufacturing of statues and models
- Souvenir production

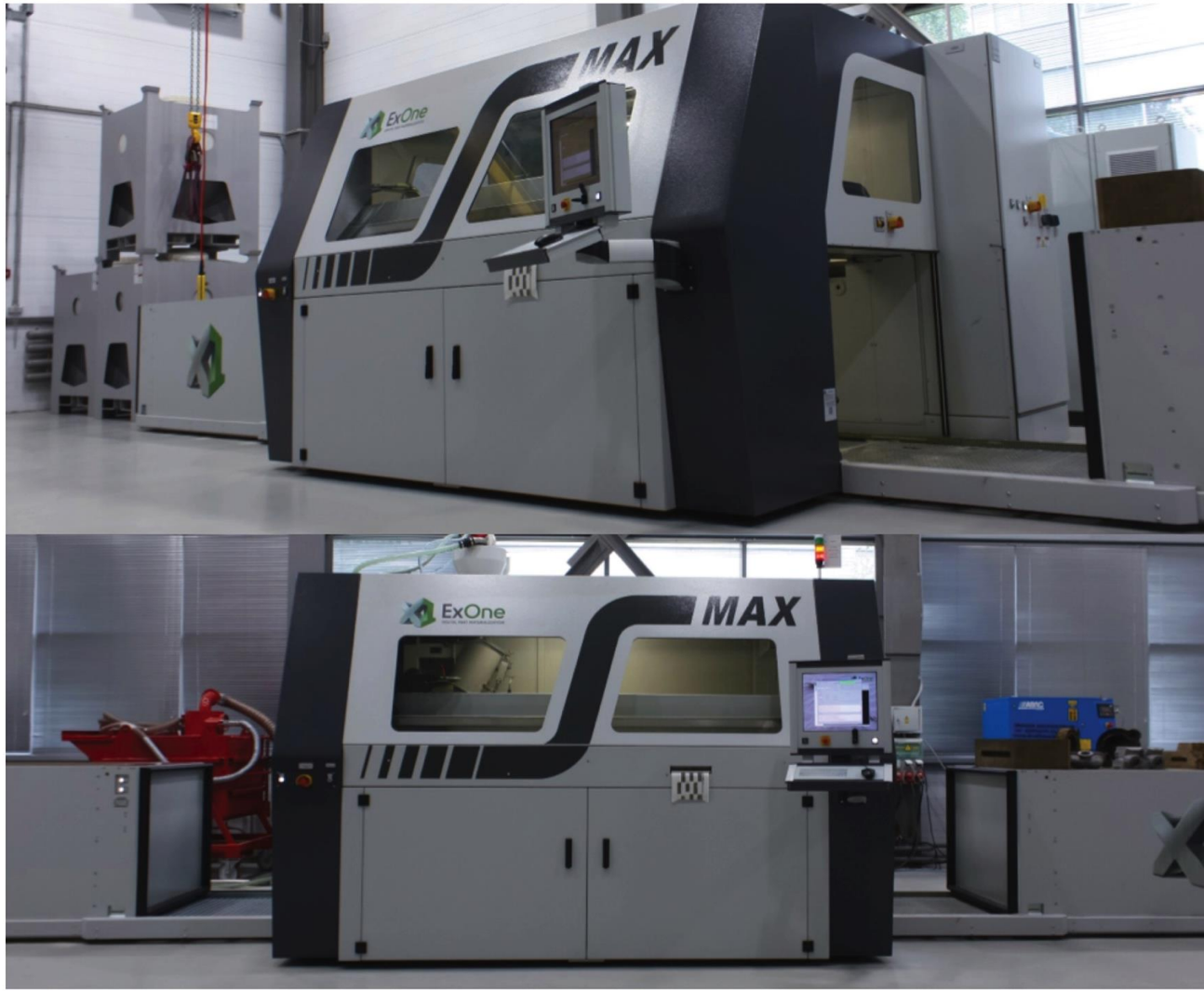
1800x1000x700 mm
printing size
(l*w*h)

2-2,5 Mpa
strengthening
of mold pulling

30 mm/hour
printing speed

0,28 mm
printing fidelity

- **QUARTZ SAND**
- **FURAN RESIN**



GE VTOMEX C450

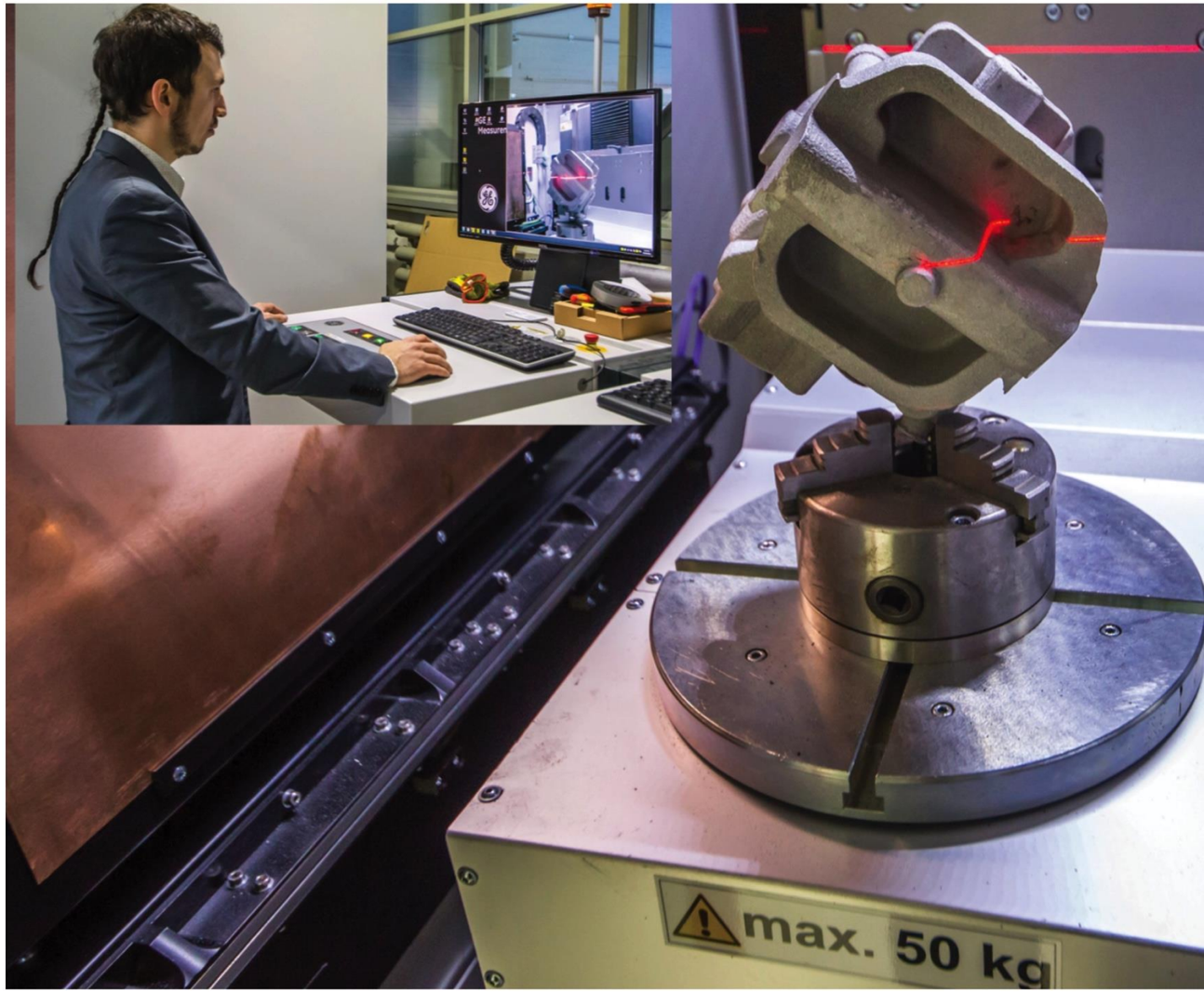
- Destructive testing (поры, pores, inclusions, cracks)
- Analysis of deviations from the mathematical model
- Analysis of wall thicknesses
- Analysis of the internal state
- Metrological control
- Reverse engineering

500x1000 mm
max. product dimensions (d*h)

50 kg
max. product mass

0,1 mm
discernibleness

60/250 mm
max. x-ray part steel/aluminum



USAGE

- Gas-dynamic calculations
- Thermodynamic calculations
- Strength calculations

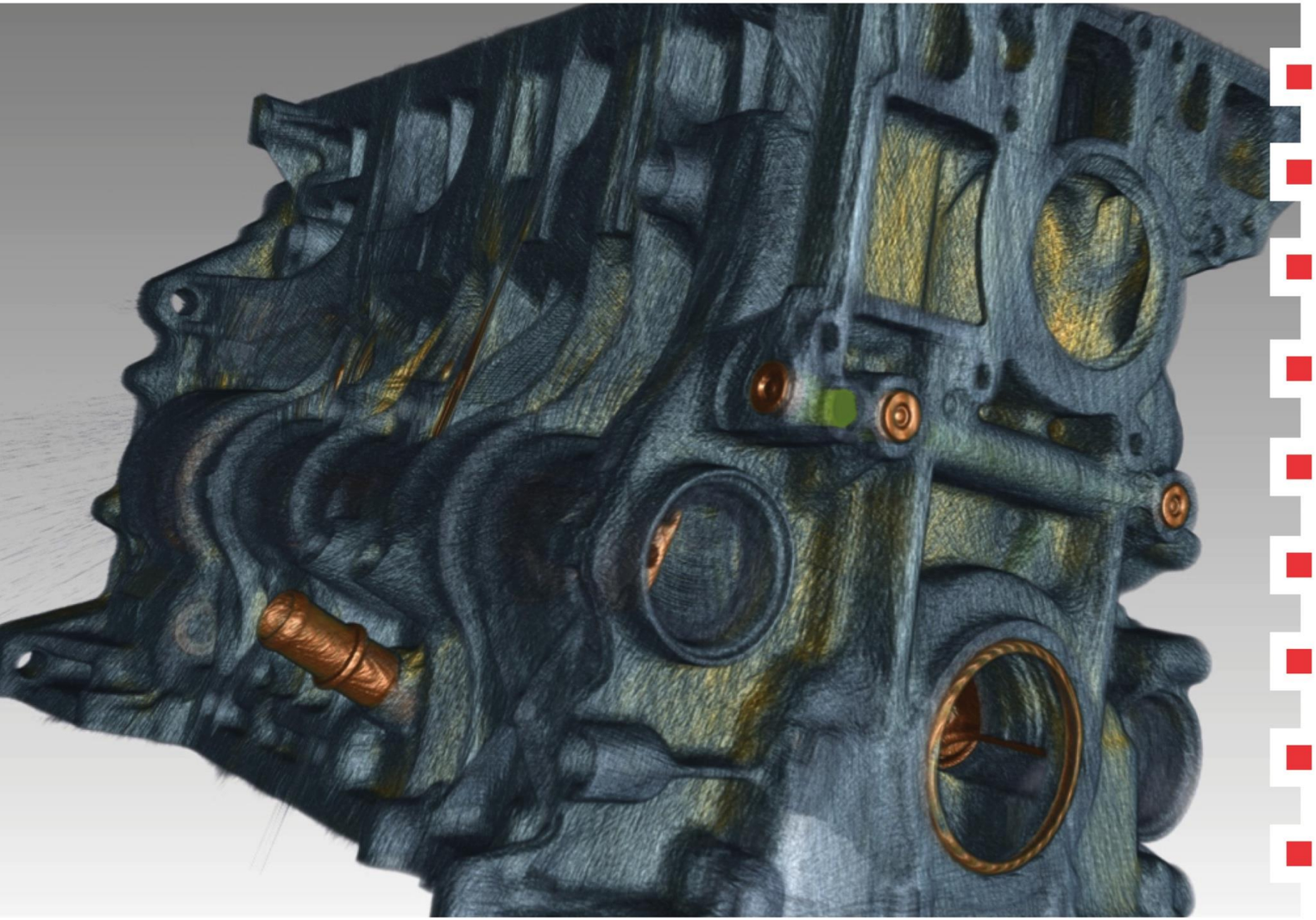
- 12 teraflops productivity
- submersible liquid cooling

ПО

- ATOS professional V8
- VG studio max 3.0
- LVM Flow CV Version 4.7
- Siemens NX10

esi get it right®

\+ Centre of Digital Technologies



- FOUNDRY CASTING WORK
- 3D PRINTING
- ENGINEERING
- 3D SCANNING
- 3D MODELLING
- COMPUTER TOMOGRAPHY
- COMPUTER MODELLING
- LABORATORY RESEARCHING
- REVERSE ENGINEERING

STAGES OF THE OPERATION

1. Casting design based on 3D models or drawings details of the customer
2. Design of gating-feed mechanism (casting technology development)
3. Simulation of the casting process
4. Design of foundry molds or model-rod rigging
5. 3D-printing of molds and manufacturing of equipment, followed by molding
6. Filling
7. Treatment and processing of castings (shot-blasting, sand-water cleaning, heat treatment, welding)
8. X-ray inspection of castings
9. The analysis of deviations from the 3D-model with help of a 3D-scanner or tomography
10. Analysis of wall thicknesses using tomography

- **100 kg** of aluminum
- **up to 600 kg** alloys of steel
- **up to 300 kg** alloys of cast iron
- **3,5 mm** min. thickness of walls
- OST 1.90021-90 ЛТ5-ЛТ7
- GOST R 53464-2009 9-12 class of accuracy

CASTING OF ANY COMPLEXITY

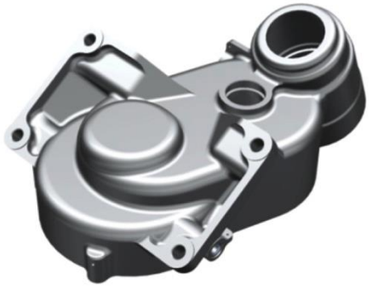
FOUNDRY AND CORE-SAND MOLD PRINTING OF ANY COMPLEXITY

ADDITIONAL USAGE

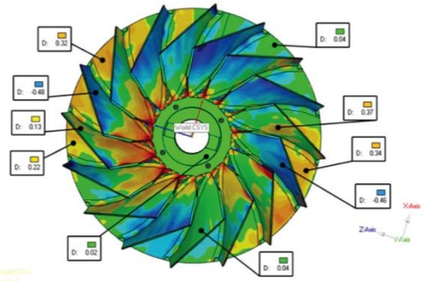
MANUFACTURING OF MODELS

SOUVENIR PRODUCTION

DEVELOPMENT OF 3D-MODEL BASED ON PLANS AND SKETCHES OF THE CUSTOMER



CREATION OF THREE-DIMENSIONAL DIGITAL COPIES OF OBJECTS



USAGE

- Variance analysis from CAD-model
- Metrological control
- Interoperational inspection
- Reverse engineering
- Wear analysis
- Digital archivation

SCANNING AND SAMPLE INSPECTION

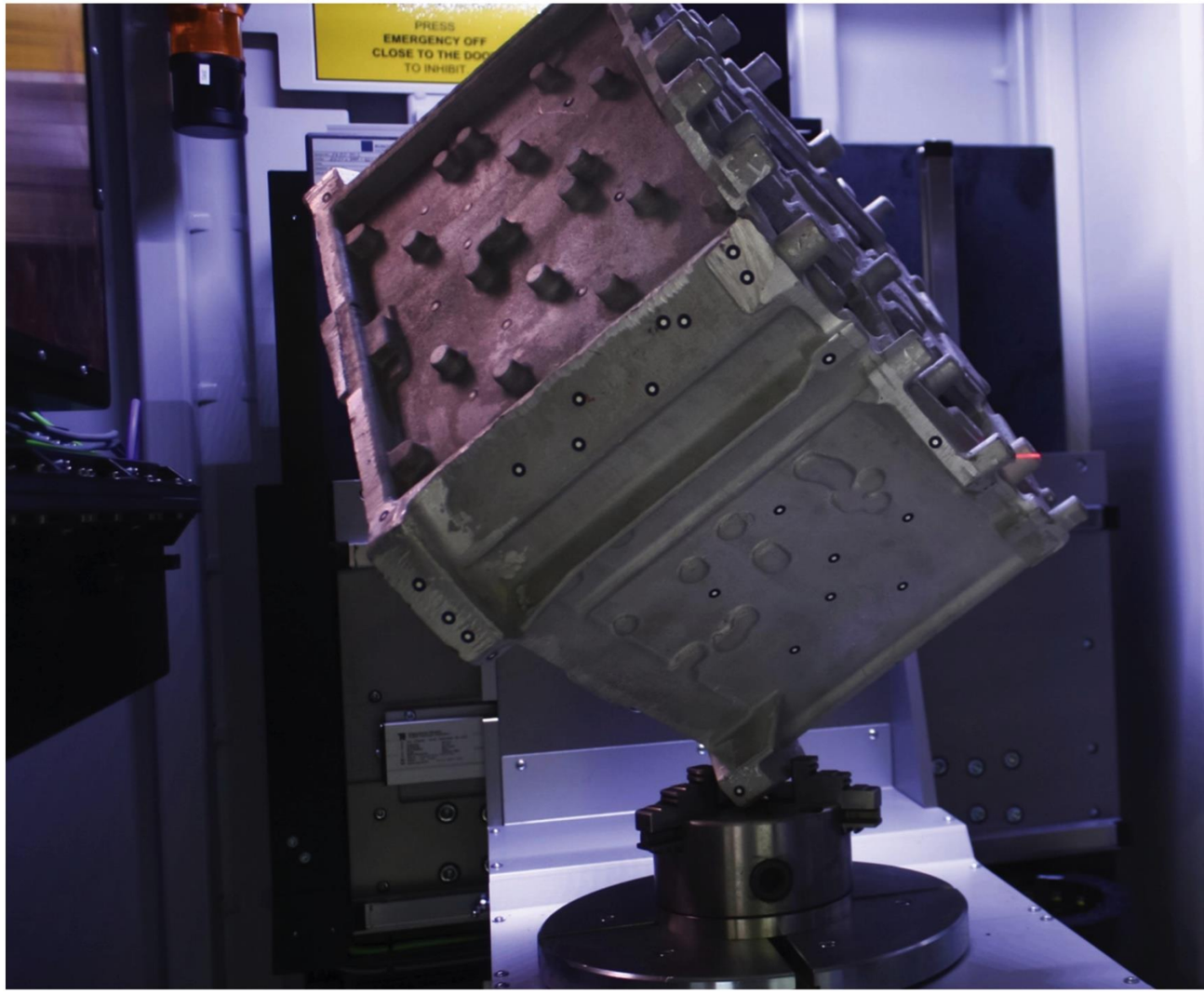
500x1000 mm
max. product dimensions (d*h)

50 kg
max. product mass

0,1 mm
discernibleness

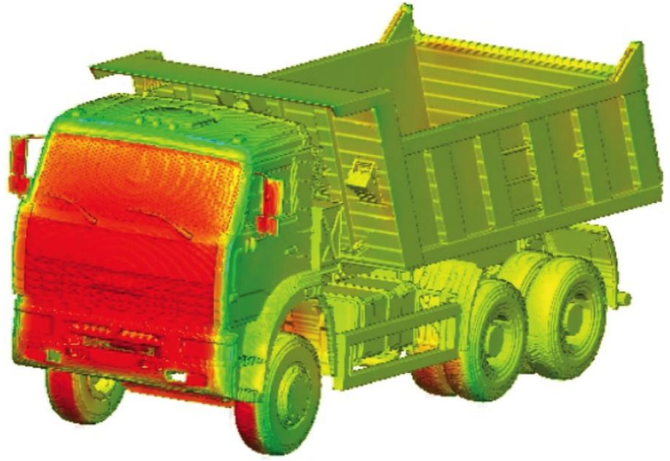
60/250 mm
max. x-ray part steel/aluminum

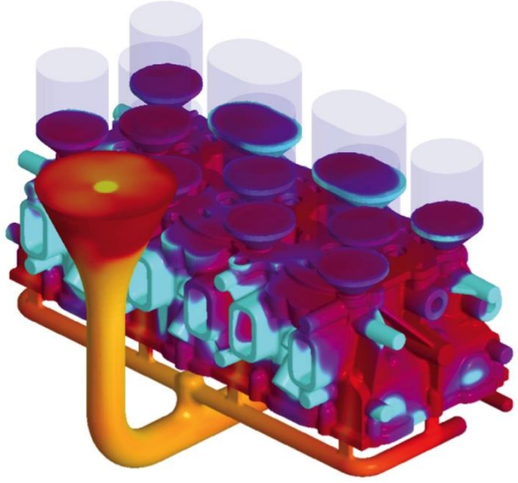
- Destructive testing (поры, pores, inclusions, cracks)
- Analysis of deviations from the mathematical model
- Analysis of wall thicknesses
- Analysis of the internal state
- Metrological control
- Reverse engineering



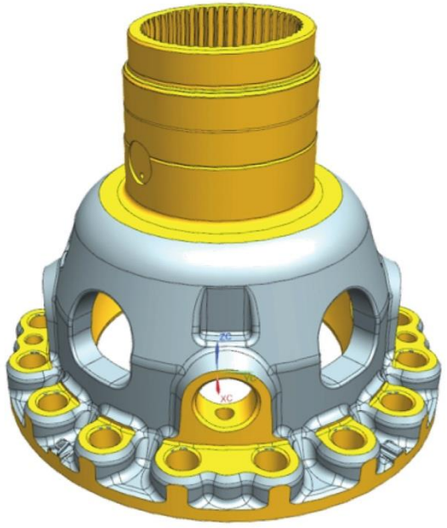
SCANNING AND SAMPLE INSPECTION

- COMFORT
- COMPOSITES AND PLASTICS
- NOISE VIBRATION AND DYNAMICS
- SHEET STAMPING
- VIBRO-ACOUSTICS
- CRASH TESTS AND SAFETY
- ELECTROMAGNETISM
- FOUNDRY
- CASTING HYDRODYNAMICS
- MULTIPHYSICS
- PAYMENTS INTEGRATION SYSTEM

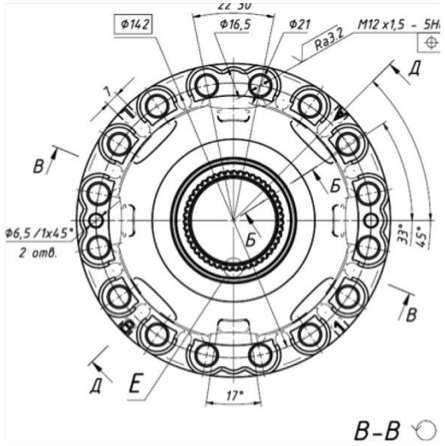




CONSULTING SERVICES



SOLUTION OF ENGINEERING TASKS



Getting the product geometry, internal geometry of channels and cavities with high accuracy

Determination of the parts material in the metallographic laboratory

Engineering calculations to test and optimize the results

The development of CAD-models and design documentation

- CHEMICAL ANALYSIS
- ANALYSIS OF MECHANICAL PROPERTIES
- ANALYSIS OF MICRO/MACROSTRUCTURE
- X-RAY CONTROL
- OPTICAL 3D-SCANNING

COMPUTER TOMOGRAPHY OF HELICOPTER MI-8 CONTROL UNIT

TASK

- investigation of the Mi-8 helicopter control unit
- restoration of the operating principle of the hydraulic circuit, evaluation of the correctness of its operation
- determination of the position of the distributing windows of spools at the time of the crash

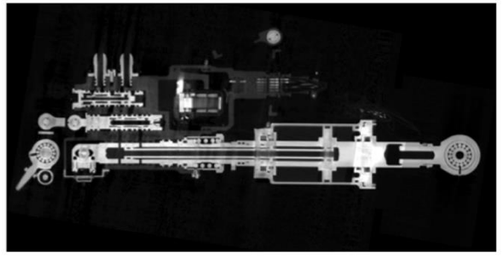
SOLUTION

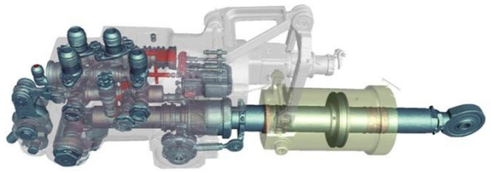
Scanning was carried out on an industrial X-ray tomographic scanner GE vtomex c450 using a linear detector.

The main requirement of the customer was the possibility of scanning without unpacking the unit from polyethylene film and polystyrene in order to completely exclude the possibility of getting damage during the tomography study.

In order to obtain the maximum possible quality of the final result, a linear detector was used, which shields the scattered radiation and has a wide dynamic range.

INDUSTRY:
AIRCRAFT INDUSTRY
CUSTOMER:
INTERSTATE AVIATION COMMITTEE (IAC)
TECHNOLOGIES:
INDUSTRIAL COMPUTER TOMOGRAPHY





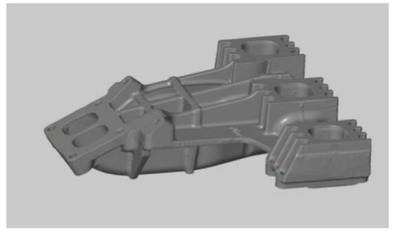
In the course of the research, the unit was further divided into materials (aluminum alloys, steel, etc.), a study of the position of the distributing windows of the spools was fulfilled as well as a separation of the working fluid channels in a separate color to facilitate the restoration of the hydraulic circuit.

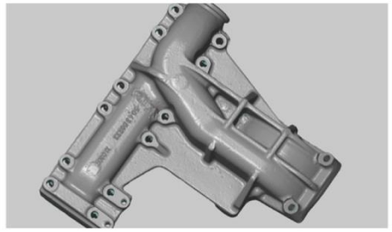
As a result of scanning, a crack was found in one of the high-pressure nozzles.

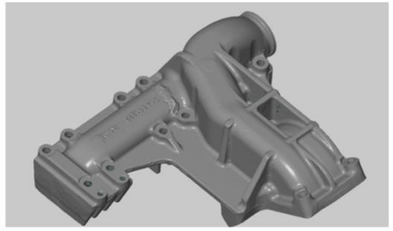
Additional hydrotests showed that, despite the crack, the nozzle remained tight and did not cause a plane crash.

Also, the study showed that the control unit at the time of the disaster was working properly.

REVERSE ENGINEERING OF COLLECTOR







TASK

Manufacturing of a series of spare parts for imported agricultural machinery, which periodically fails to function due to breakages of original cast parts.

SOLUTION

The reverse engineering of the collector from imported agricultural machinery has been completed and a series of castings has been produced.
For the reverse engineering of the cast iron collector a high-quality scanning of the original repaired part was executed on an optical 3D scanner ATOS III Triple Scan XL. Scanning resulted in a 3D model of the collector in the format .STL (cloud of points in space), on which the engineer had designed a solid-state 3D model of the part, suitable for production.

According to the received solid model, a sprue-feeding system was designed, as well as a computer simulation of the filling process was performed.

INDUSTRY:

AGRYCULTURAL INDUSTRY

CUSTOMER:

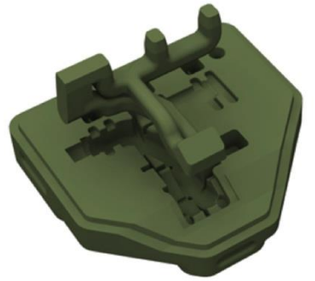
LLC «AK BARS AGRO»

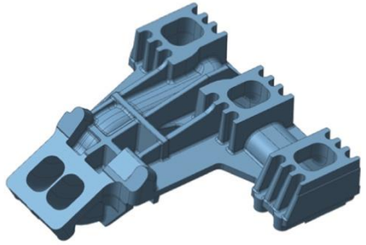
TECHNOLOGIES:

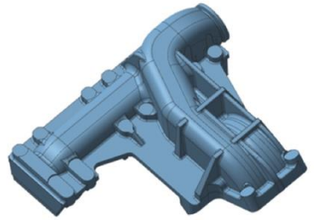
3D SCANNING
3D PRINTING
FOUNDRY CASTING WORK

Casting molds were made to receive castings using additive technologies on the industrial 3D printer ExOne S-Max.

Produced castings were successfully installed on the machinery and they are functioning well now.



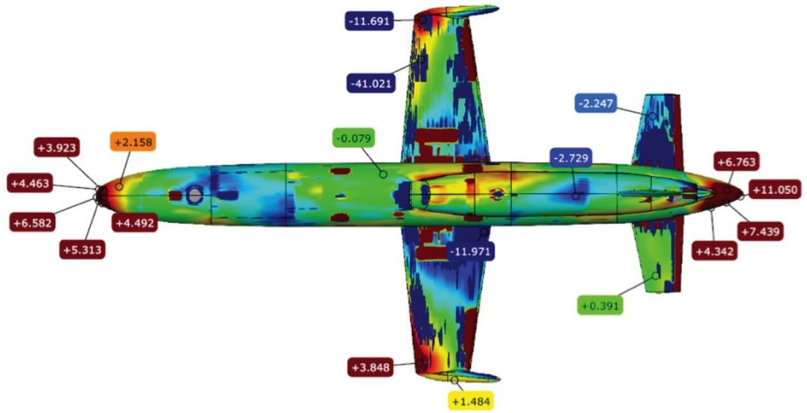




SCANNING OF UNMANNED AERIAL VEHICLE

TASK

Scanning of an unmanned aerial vehicle.



SOLUTION

The work was carried out on an optical 3D scanner ATOS III Triple Scan XL.
The purpose of scanning was to analyze the deviation of the geometry after the test flight and the possibility of further application of the product. The length of the unmanned aircraft is about 4.5 m, the scanning time is about 4 hours.

The similar work also was done on the other products for the purpose of interoperational technological control of the assembly process. The maximum calibration accuracy achieved at this object was 11 microns (0.011 mm).

INDUSTRY:

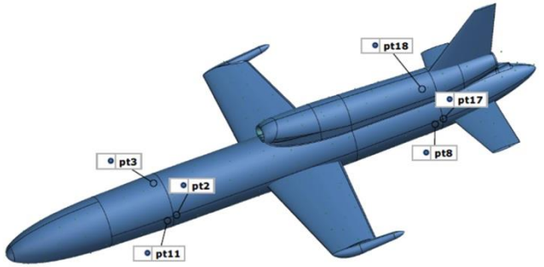
AIRCRAFT INDUSTRY

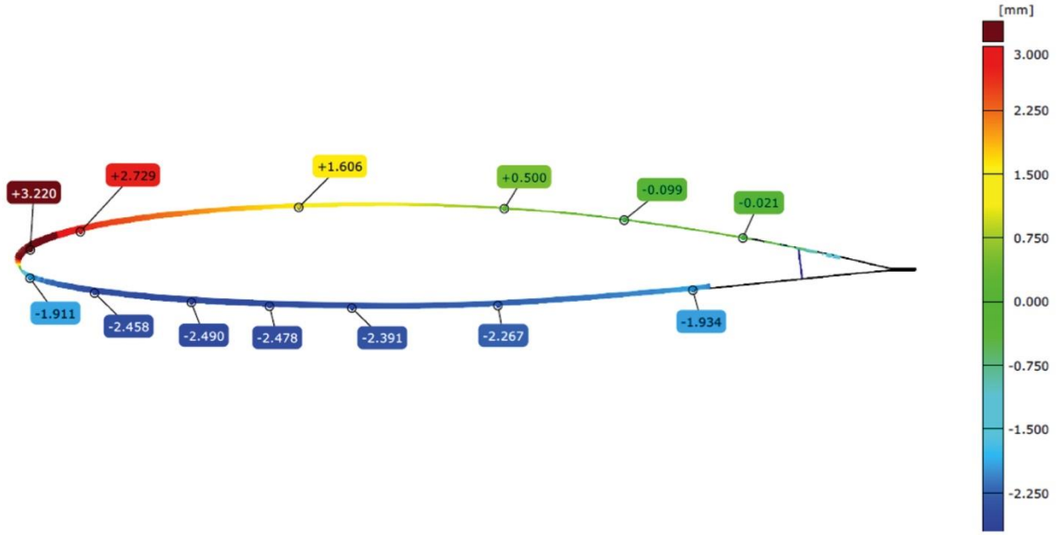
CUSTOMER:

JSC Research and Production Association “Experimental Design Bureau named after M.P.SIMONOV”

TECHNOLOGIES:

3D SCANNING





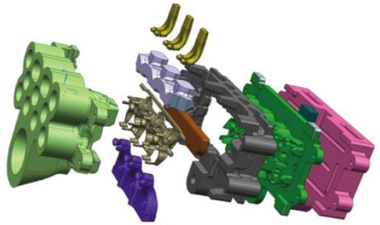
PRODUCTION OF SET OF CASTINGS FOR ENGINE

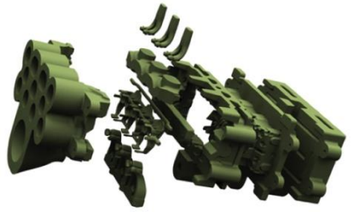
TASK

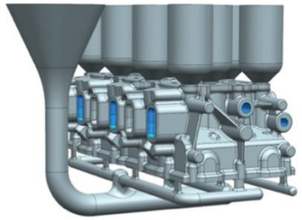
Production of a batch of castings for a three-cylinder reciprocating engine.

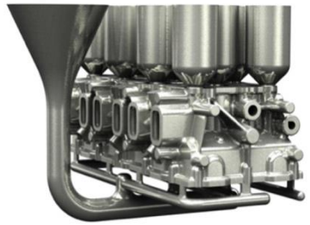
SOLUTION

According to the 3D models provided by the customer, some castings with the runner-feeding systems were designed, the computer modelling of the filling process in the program LWM Flow was performed for the castings. Based on the results of modelling, the casting forms were designed and made on the 3D printer ExOne S-Max. On the foundry floor located on the territory of KAZ named S.P. Gorbunov the obtained castings were heat treated.









INDUSTRY:

ENGINE BUILDING

CUSTOMER:

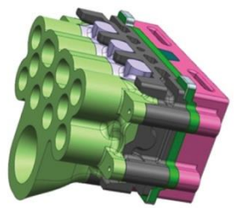
OJSC Mining and Metallurgical Plant «AGAT»

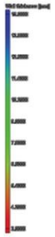
TECHNOLOGIES:

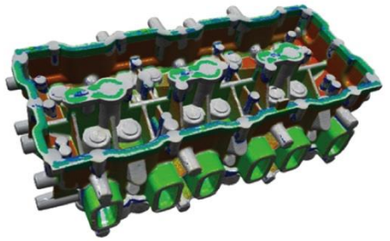
3D PRINTING
FOUNDRY
COMPUTER TOMOGRAPHY

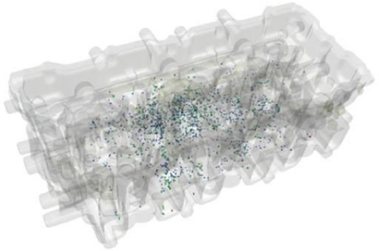
Each casting passed 100% x-ray inspection on the industrial computer tomograph GE vtomex c450, defect analysis, analysis of the deviation from the 3D model and analysis of the wall thickness were fulfilled.

All the received products have successfully undergone hydrostatic tests for leaks.









PRODUCTION OF MOLDING CASTINGS

TASK

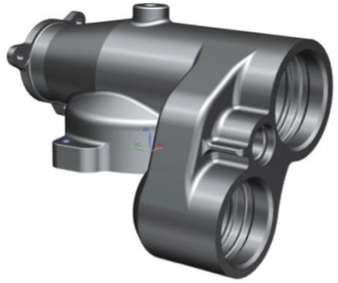
Production of castings for aircrafts Tu-214, Tu-22M3 and Tu-160.

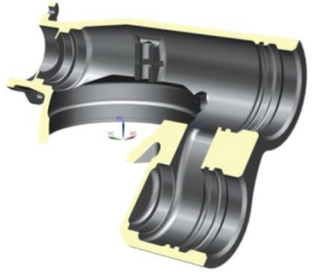
SOLUTION

In the framework of cooperation with KAZ named after S.P. Gorbunov the castings for aircrafts Tu-214, Tu-22M3 and Tu-160 are produced. The castings are made by casting into the ground using the technology of cold-hardening mixtures (CHM). For each name of a casting made of wood or plastic, a molding equipping is made.

It was mastered more than 150 names of castings, each casting passes 100% X-ray control, as well as geometry control on the scanner.

INDUSTRY:
AIR CRAFT INDUSTRY
CUSTOMER:
KAZ NAMED AFTER S.P. GORBUNOV
TECHNOLOGIES:
3D PRINTING
FOUNDRY
COMPUTER TOMOGRAPHY





PRODUCTION OF CASTINGS

TASK

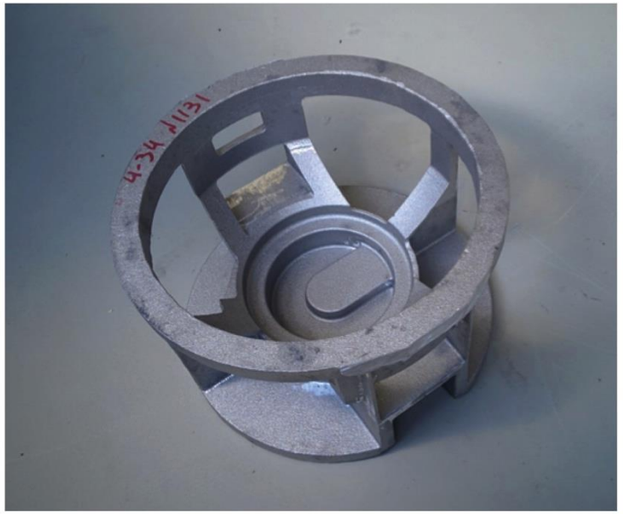
Manufacturing of castings for the Kazan plant «Elektropribor».

SOLUTION

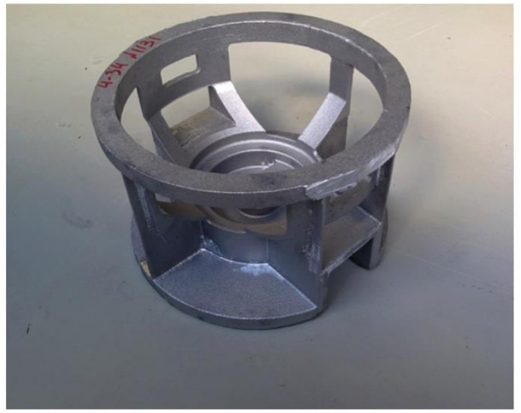
For the Kazan plant «Elektropribor» a few positions of cast parts have been mastered. In connection with the increased requirements for the accuracy of castings on the CNC machine a molding equipping made of special impact-resistant plastic was produced.

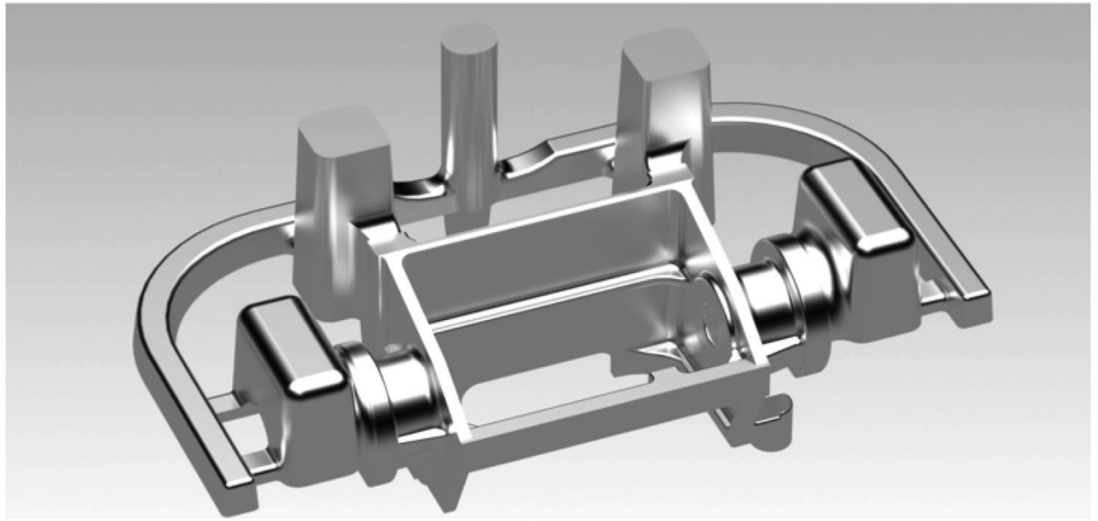
The filling process is modeled in the software package LWM Flow. The castings are made by the method of gravity casting in CHM (cold-hardening mixtures).

The obtained castings undergo thermal treatment and 100% X-ray control on the tomographic scanner.



INDUSTRY:
AIRCRAFT INDUSTRY
CUSTOMER:
OJSC KAZAN PLANT «ELECTROPRIBOR»
TECHNOLOGIES:
FOUNDRY
COMPUTER MODELLING
COMPUTER TOMOGRAPHY





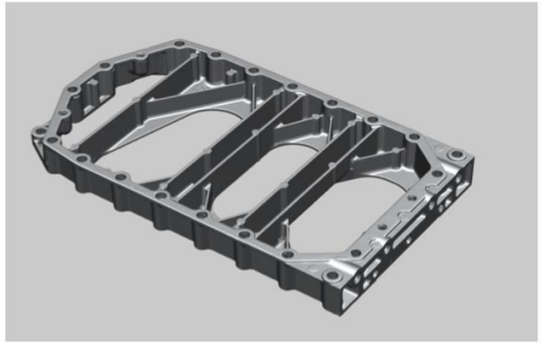
SCANNING OF DIESEL ENGINE

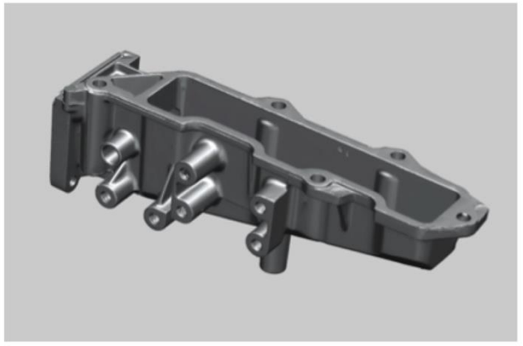
SOLUTION

The project to develop a hybrid power plant, which includes a generator based on a diesel engine, requires obtaining a detailed geometry of the engine for its most efficient location in the environment.

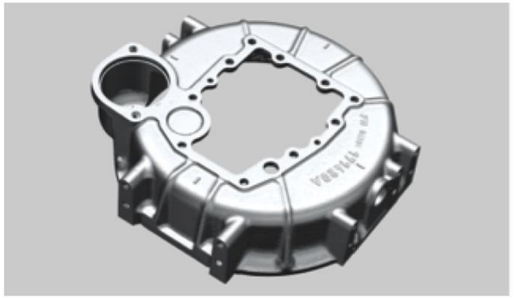
For this purpose, the engine was completely digitized in assembly on an optical 3D scanner ATOS III Triple Scan XL.

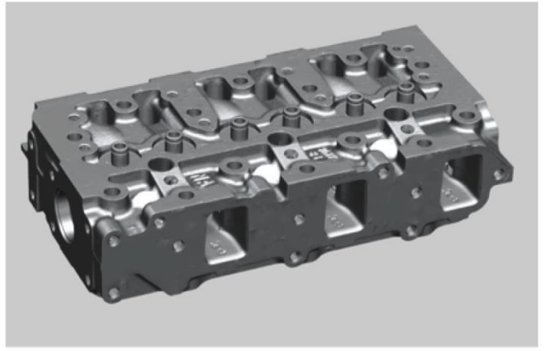
In addition, reverse engineering of several cast parts was performed to provide the project with spare parts. For this, scanning and subsequent development of the solid 3D models of the given parts were carried out.

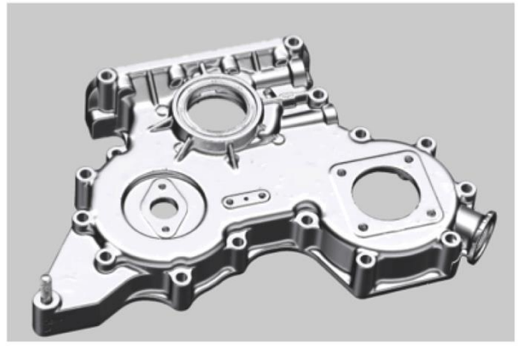




INDUSTRY:
ENGINE BUILDING
CUSTOMER:
LLC “PROJECT-ENGINEERING COMPANY”
TECHNOLOGIES:
3D SCANNING,
COMPUTER TOMOGRAPHY,
3D-PRINTING







TOMOGRAPHY OF MOTOR HELMETS

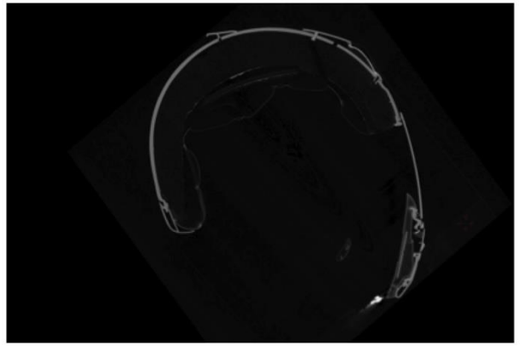
SOLUTION

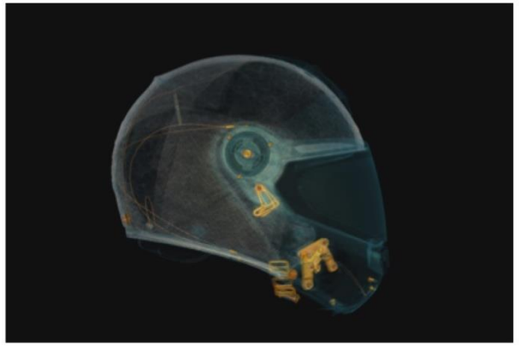
For the project to create smart helmets with a built-in navigation system, the popular samples were scanned on a computer tomographic scanner.

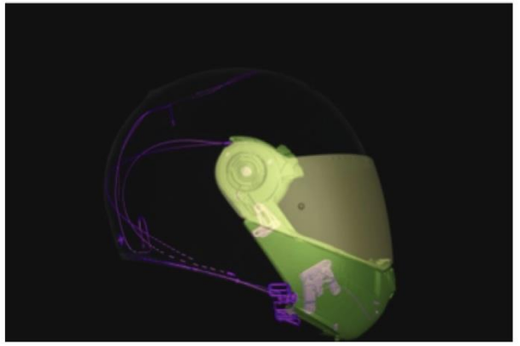
As a result of scanning, the geometry of the internal and external structure was obtained and the basis for subsequent reverse engineering of the helmets was created. For a more accurate separation of the materials during an X-ray tomography, a highly sensitive linear detector was used.

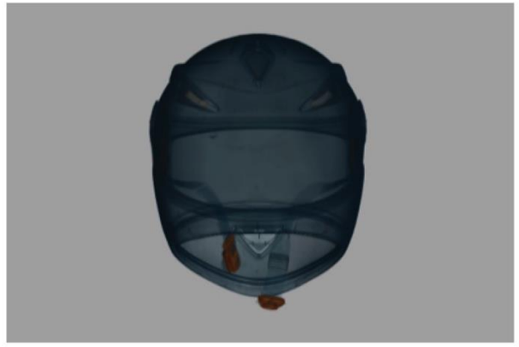
When processing the result, the helmets were divided into the materials: plastic, composite and metal parts were identified. Also, a virtual disassembly was performed, with a separation of a visor, a jaw and metal fasteners into a 3D model.

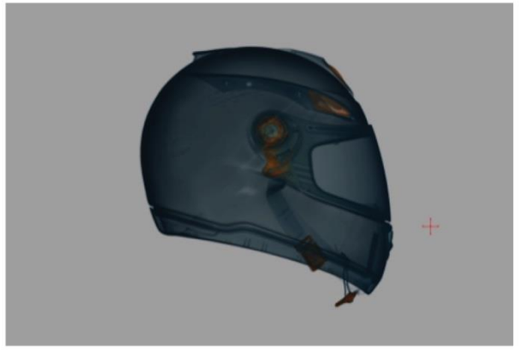
TECHNOLOGIES:
3D SCANNING
COMPUTER TOMOGRAPHY

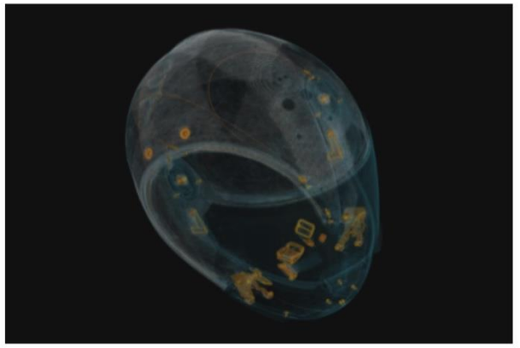












CENTER FOR COMPETENCIES OF FOUNDRY

Центр Цифровых Технологий + ОАК = Центр Компетенций Литья

- Optimization of foundry production
- Scaling of advanced production technologies
- Reduced costs for foundry
- Reducing the cost of production
- Increasing the competitiveness of products

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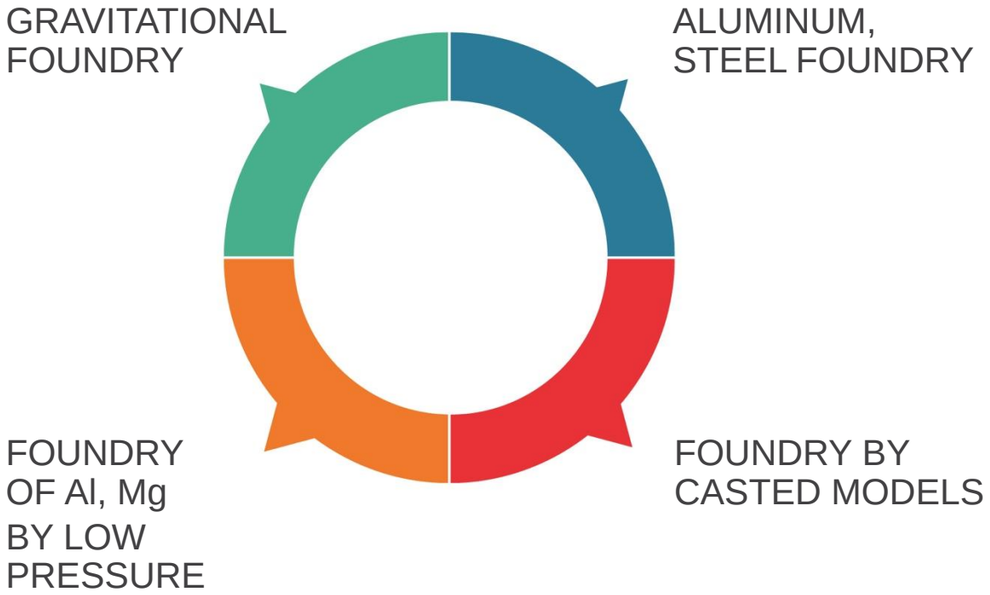
КАЗАНСКИЙ АВИАЦИОННЫЙ ЗАВОД ИМ. С.П. ГОРБУНОВА - ФИЛИАЛ ОАО «ТУПОЛЕВ»



SCANNING OF GAS TURBINE ENGINE

TASK

Digitalization of all parts and nodes of the perspective turboreactive engine.

SOLUTION

To obtain the geometry of the perspective gas turbine engine its complete disassembly and digitization was performed using a high-precision 3D scanner ATOS III Triple Scan XL. The received data were processed and transferred to the customer for further work.

INDUSTRY:
AIRCRAFT INDUSTRY
CUSTOMER:
CONFIDENTIAL INFORMATION
TECHNOLOGIES:
3D SCANNING

REVERSE ENGINEERING OF DIESEL ENGINE

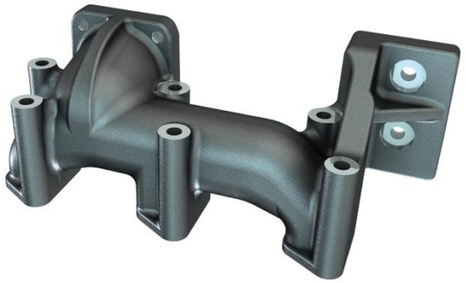
TASK

Reverse engineering of diesel engine ICE (internal-combustion engine) in the framework of the project for the development of a hybrid power plant.

SOLUTION

To complete the task, the engine was completely dismantled, each part was scanned with high accuracy using an optical 3D ATOS scanner III Triple Scan XL. The obtained models STL were transferred to the CAD system Siemens NX for the subsequent production of the design solid models. For the parts obtained by foundry, the castings with a sprue-feeding system were designed, the filling process was modeled in the program LVMFlow.

INDUSTRY:
MECHANICAL ENGINEERING
CUSTOMER:
CONFIDENTIAL INFORMATION
TECHNOLOGIES:
3D SCANNING
3D MODELLING
REVERSE ENGINEERING
MODELLING OF
FOUNDRY PROCESSES



REVERSE ENGINEERING AND OPTIMIZATION OF HOCKEY STICKS

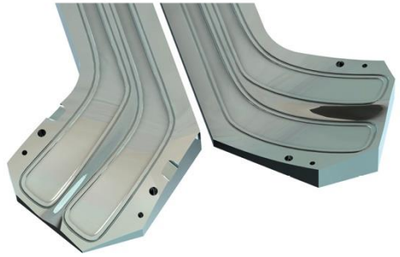
TASK

Optimization of bends of hockey sticks and production of pasting equipping.

SOLUTION

In order to optimize the bends of hockey sticks, they were scanned using the 3D scanner ATOS III Triple Scan and industrial tomograph GE vtomex c450. The resulting geometry was transferred to the CAD system Siemens NX for the design and optimization of solid-state models of sticks and the subsequent development of pasting equipping.

INDUSTRY:
MECHANICAL ENGINEERING
CUSTOMER:
LLC «ZARYAD»
TECHNOLOGIES:
3D SCANNING
INDUSTRIAL TOMOGRAPHY
3D MODELLING
REVERSE ENGINEERING



SET OF CASTINGS FOR PERSPECTIVE ENGINE

TASK

Production of a batch of castings from aluminum alloy AK8M3h for perspective opposing engine ICE.

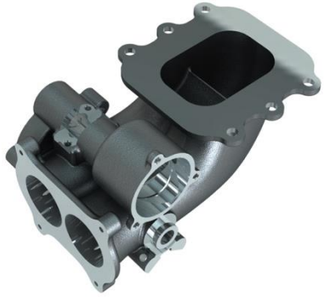
SOLUTION

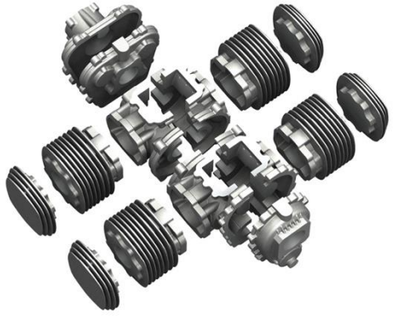
To manufacture these products, the latest technologies in the field of foundry were applied. For each casting a sprue-feeding system was designed and the filling process in the program LVMFlow was modeled.

Based on the results of modelling, casting folds were designed and made on the 3D printer ExOne S-MAX. Filling and heat treatment were carried out at the foundry floor located on the territory of KAZ named after S.P. Gorbunov.

Each casting passed 100% x-ray monitoring on the industrial tomographic scanner GE vtomex c450, as well as control of the accuracy of geometry using a high-precision 3D scanner ATOS III Triple Scan XL.

INDUSTRY:
MECHANICAL ENGINEERING
CUSTOMER:
CONFIDENTIAL INFORMATION
TECHNOLOGIES:
3D PRINTING
FOUNDRY
MODELING OF FOUNDRY PROCESSES
COMPUTER TOMOGRAPHY
3D SCANNING





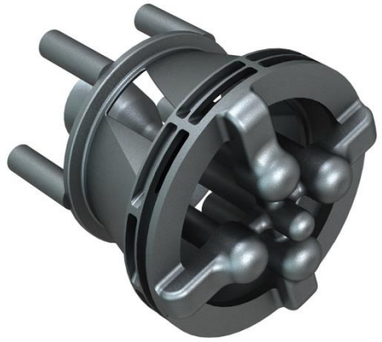
CASTING FOR INNOVATIVE SEPARATOR

TASK

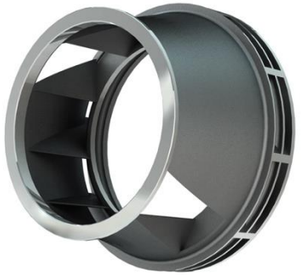
Production of a casting for testing an experienced innovative separator.

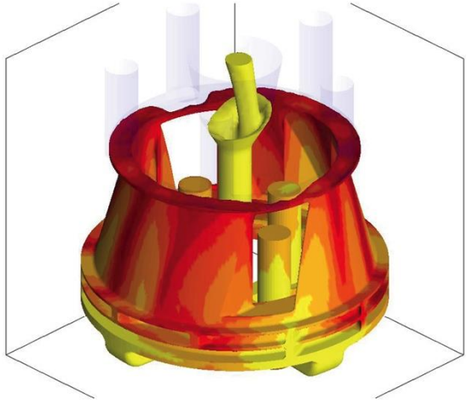
SOLUTION

To test the innovative separator according to the customer's drawings, a 3D model of the part and casting was built. Filling and heat treatment was carried out at the foundry floor on the territory of KAZ named after Gorbunov. For making a casting, a complex sprue-feeding system was designed, and the filling process was modeled in the program LVMFlow. The casting forms were made using the 3D printing method on the printer S-MAX ExOne.



INDUSTRY:
MECHANICAL ENGINEERING
CUSTOMER:
CONFIDENTIAL INFORMATION
TECHNOLOGIES:
3D-MODELLING
3D-PRINTING
FOUNDRY
MODELING OF FOUNDRY PROCESSES





CASTING FOR PERSPECTIVE COMPRESSOR

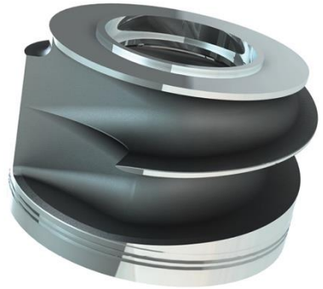
TASK

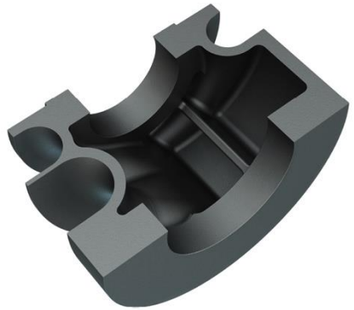
Manufacture of castings from high-strength cast iron for a flow part of the experienced compressor.

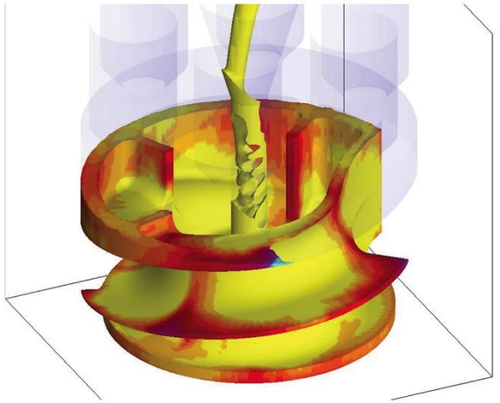
SOLUTION

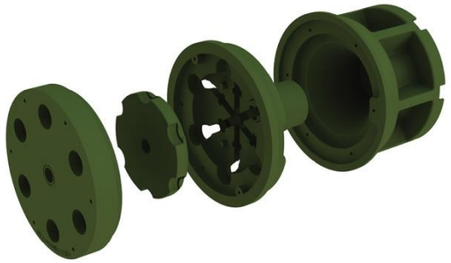
For the bench tests of the prospective compressor, castings were made from cast iron CGI35. According to the customer's drawings, 3D models of the parts and castings were built. Filling and heat treatment were carried out at the foundry floor on the territory of KAZ named after Gorbunov. For manufacture of the castings, a sprue-feeding system was designed, and the pouring process was modeled in a program LVMFlow. The casting forms were made on a 3D printer S-MAX ExOne.

INDUSTRY:
MECHANICAL ENGINEERING
CUSTOMER:
JSC «NIITURBOKOMPRESSOR NAMED AFTER V.B.SHNEPP»
TECHNOLOGIES:
3D MODELLING
3D PRINTING
FOUNDRY
MODELING OF FOUNDRY PROCESSES









ОКБ им. М.П. Симонова

ЦИАМ

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ОАК

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КАПО им. С.П.Горбунова

Team KAMAZ master

ОКБ им. М.П. Симонова

1895 Зеленодольский завод им. А.М. Горького

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ТРАНСМАШХОЛДИНГ

CONTACT DETAILS

JOINT-STOCK COMPANY
«CENTRE OF DIGITAL TECHNOLOGIES»

420127, Republic of Tatarstan,
Kazan, 1, Dementieva str.

+7 (843) 204 75 05
+7 (843) 570 82 07

info@kcdt.ru

www.kcdt.ru