



GROUP

ORGANIZATION OF FOUNDRY PRODUCTION – OF A VACUUM CASTING SITE FOR LOST-WAX (CONSUMABLE) PATTERN OF GAS TURBINE ENGINE PARTS





Project Initiator	MC IED-HOLDING LLC
Investment Start	Since 2023

Annotation:

One of the activities of IED-Holding Group of Companies (KR Group) is the overhaul and service maintenance of imported gas turbines with its own production of spare parts according to drawings made by reengineering and material analogue for domestic steels and alloys. In the process of carrying out repairs and manufacturing spare parts, the main problem is obtaining castings for turbine nozzles and blades. There is simply none on the market, or enterprises with modern casting technologies of Rostech are occupied with other orders. Due to limited resources, the demand for this product ranges from 20 to 40 sets* per year. In this regard, in order to import substitution and to eliminate the risks associated with a monopoly in the supply of rotor blades and turbine stators for gas turbine engines, we decided to organize our own foundry in the city of Kazan at our own production base.

The products of the project are blanks (castings) for the future production of rotor blades and turbine stator on a gas turbine engine. Our subsidiaries manufacture blades. For this purpose, R&D will be carried out (reengineering and creation of design documentation for new castings, and subsequently blades), the design and new construction of a production building have been carried out, and the necessary technological equipment has been selected and purchased.

* The technological repair kit is 50% of the volume of the blades of one machine.

FORECAST OF ORDERS FOR GAS TURBINE ENGINE REPAIRS FOR THE PERIOD FROM 2024 TO 2027* AT MC IED-HOLDING

(with replacement of turbine rotor blades and S/A, subject to their availability in the components).

Products	Forecast for each year*				Total
	2024	2025	2026	2027	
	Comlects	Comlects	Comlects	Comlects	Pcs.
TAURUS-60/70	10	10	12	15	47
MAN-10/12	2	2	1	1	6
LM-6000	1	1	3	5	10
MARS-100	1	3	3	5	12
SGT-300/400/700	2	4	4	4	14
HK-12CT	4	4	5	7	20
HK-14CT	2	2	3	5	12
TITAN-130	1	2	2	3	8
Total per year:	23	28	33	45	129

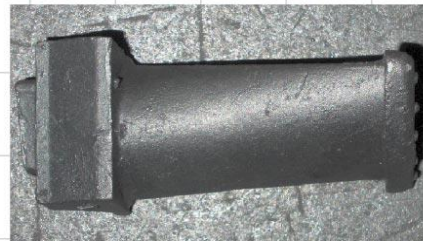
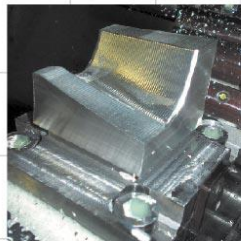
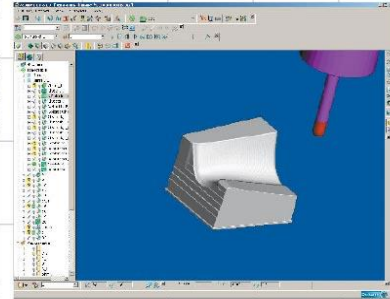
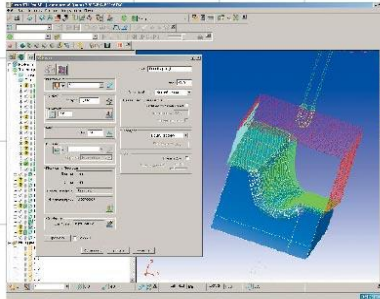
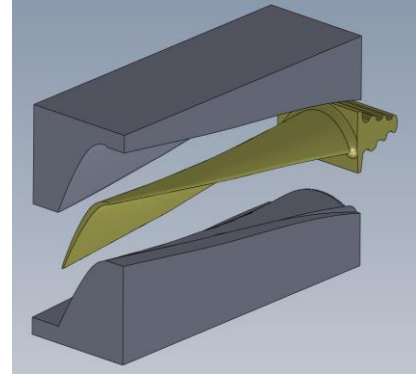
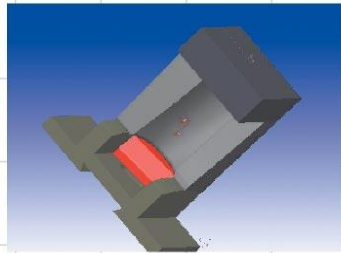
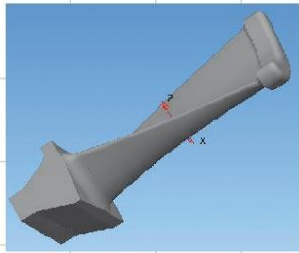
* The forecast for 2024 is based on already concluded contracts with customers; data for 2025-2027 has been formed based on preliminary applications from Lukoil, GazpromNefit, Gazprom Teploenergo, Rosneft and RusHydro.



NOMENCLATURE AND CHARACTERISTICS OF PRODUCTS

№p/ p	Product	Blade designation	Code	Existence of an internal cavity	Weight, gr.	Quantity, pcs. in section (for nozzle blades)	Number of pieces as a set	Demand % of total number
1	TAURUS-60/70	Section Nozzle 1st stage	T60410001	cooled	755	2	15	4.3%
2		Working blades 1st stage	T60415001	cooled	90		62	17.5%
3		Section Nozzle 2nd stage	T60420001	uncooled	837	3	14	3.4%
4		Working blades 2nd stage	T60425001	uncooled	125		50	12.3%
5	MAN 10/12	Section Nozzle 1st stage	KS0295410	cooled	419		32	1.0%
6		Working blades 1st stage	KS0078709	cooled	210		70	2.2%
7		Section Nozzle 2nd stage	KS0295269	uncooled	980	3	22	0.6%
8		Working blades 2nd stage	KS0294875	uncooled	268		70	1.9%
9	LM-6000	Working blades 1st stage HPT	1639M70P21	cooled	277		80	6.6%
10		Working blades 2nd stage HPT	1881M52G14	cooled	380		74	6.5%
11		Working blades 1st stage LPT	No data				No data	-
12		Working blades 2nd stage LPT	No data					-
13		Working blades 3rd step LPT	No data					-
14		Working blades 4th step LPT	No data					-
15		Working blades 5th step LPT	No data					-
16	*MARS-100	Section Nozzle 1st stage	No data				30	2.5%
17		Working blades 1st stage	No data				120	9.8%
18	SGT-300/400/700	Section Nozzle 1st stage	SGT410001	cooled	526		34	2.1%
19		Working blades 1st stage	RW31081G	cooled	264		61	4.3%
20		Section Nozzle 2nd stage	SGT420001	uncooled	1500	4	13	1.0%
21		Working blades 2nd stage	SCG425001	uncooled	No data		59	3.6%
22	NK-12ST	Working blades 1st stage	12435010	uncooled	211		71	5.7%
23		Working blades 2nd stage	12425001	uncooled	283		69	4.0%
24	NK-14ST	Section Nozzle 1st stage	253441051	cooled	980	3	14	0.8%
25		Working blades 1st stage	25440010-1	cooled	247		71	4.2%
26	*TITAN-130	Section Nozzle 1st stage	No data			No data	24	1.1%
27		Working blades 1st stage	No data				90	4.1%

DESIGN OF A MOLD BY REENGINEERING A TURBINE BLADE



TECHNOLOGICAL DIAGRAM FOR THE PRODUCTION OF BLADE CASTINGS USING THE LOST-WAX CASTING METHOD

Ceramic rod for forming an internal cavity in a casting



Casting model made of model mass



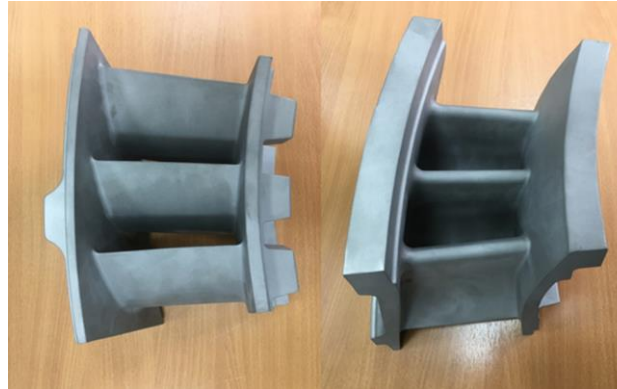
Ceramic forms



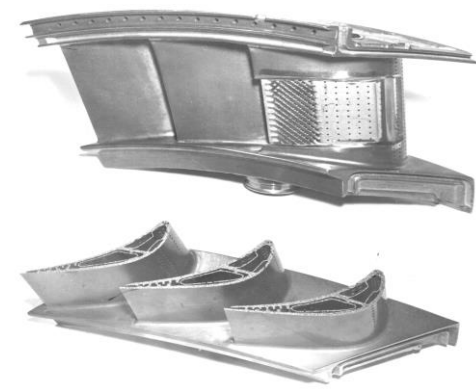
Assembled block of models with LPS



Casting a section of the nozzle apparatus



Sectional casting of a section of the nozzle apparatus



EQUIPMENT INVOLVED IN THE PROCESS OF MANUFACTURING CERAMIC MOLDS USING THE LOST WAX METHOD

Press for making ceramic rods



Installation for applying fire-resistant coating to a block of models



Installation of vacuum-ammonia drying of ceramic molds



Boilerclave for removing model mass from the cavity of a ceramic mold



Press for making casting models



Sand powder with a pseudo-fluidized layer for applying a fire-resistant coating to a block of models



**Initial rod of ZhS-6U-VI alloy
(alloy grade “heat-resistant alloy improved
by vacuum induction smelting”)**



EQUIPMENT FOR THE PREPARATION OF CHARGE MATERIALS

**Measured charge billet
alloy ZhS-6U-VI**



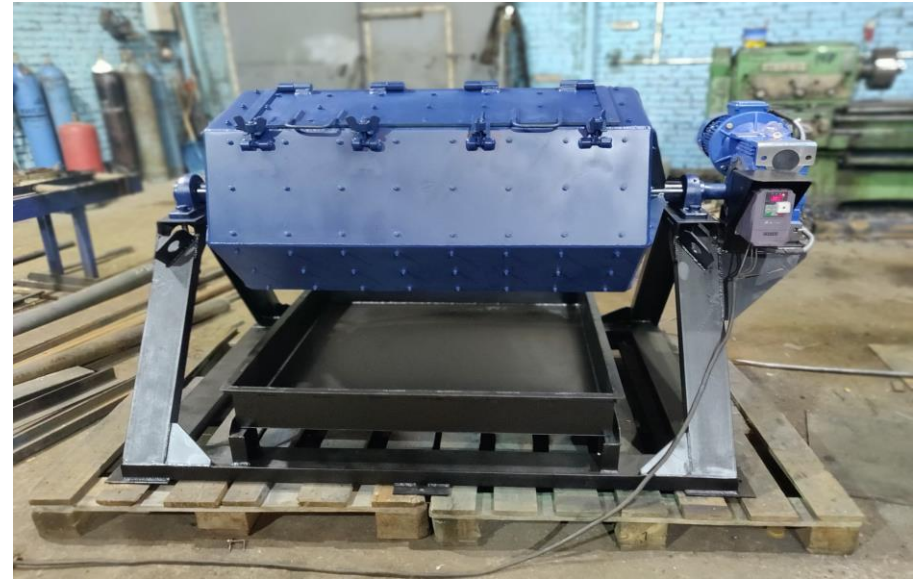
**Cutting machine for cutting “fresh” alloy
and cutting LPS**



Scales for weighing charge material



Tumbling drum



Chamber furnace for calcining ceramic molds



UPPF - installation of filling with pre-heating of ceramic molds

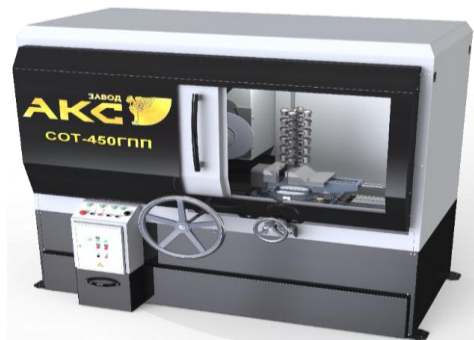




Vibration installation for removing ceramics from casting blocks



Machine for cutting off castings from LPS



Installation for blowing the surface of a casting from ceramics and carbon deposits



Installation for removing ceramics from the internal cavities of the blades.





GROUP EQUIPMENT FOR HEAT TREATMENT OF BLADES AND NOZZLE APPARATUS ASSEMBLIES.

Vacuum furnace PVV -1300 (vertical vacuum furnace)



Gas oven



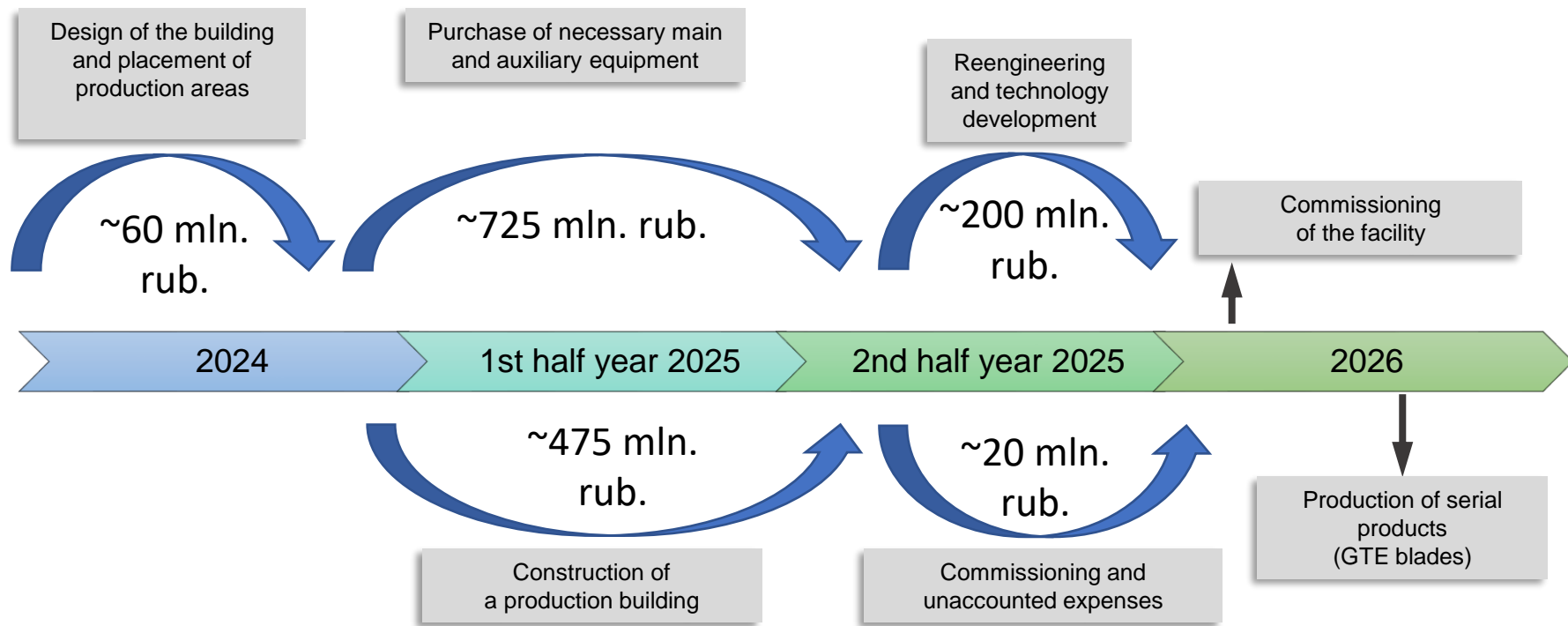


The land plot is owned. The premises will be built at the expense of the lessor - IED-Holding (KR Group of companies)

PROPOSED DIRECTIONS OF INVESTMENTS

Designation	Amount, thousand rubles	Potential Contractor	Sources of investment
Design of the building and sections	60,000	JSC Kazansky Giproviaprom	own funds / investor
Construction of a production building	475,000	LLC IED-Promstroy	own funds / Bank loan (industrial mortgage)
Costs for reengineering and design documentation for castings, debugging of casting processes	200,000	On our own with the assistance of third party specialists	FER (Foundation for Enterprise Restructuring) loan
Purchase of main and auxiliary equipment	725 000	Various suppliers	FER loan / Bank loan / leasing
Commissioning works	20,000	On our own	own funds / investor
TOTAL	1,480,000		

ROADMAP FOR THE PROJECT OF FOUNDRY PRODUCTION ARRANGEMENT



**EFFICIENCY OF THE PROJECT WITHIN THE NEXT 7 YEARS:
(PAYBACK DUE TO SAVINGS ON PURCHASING BLADES
FROM THIRD-PARTY SUPPLIERS)**

Indicator designation	Meaning
Required investments, million rubles. with VAT, incl.:	1 480
Net present value, million rubles.	4 682
Internal rate of return (IRR), %	60.18%
Project payback period, years	3.6
Discounted payback period, years	3.7
Discounted Cost Profitability Index (PI)	5
EBITDA million rubles (for 5 years of operating activity)	10,357