



VIKTOR POPOV

Chairman of the Board of PJSC "FED",

President of the Innovative Aerospace Cluster "Mechatronics"





Experience of “FED”

More than 1,300 types of main units were developed, produced serially and serviced during their operation for the following aircrafts:

Su Antonov: 124, 225, 12, 72,
74, 70, 26, 32, 140, 148, 158

Tupolev: 134, 154, 22,
160, 204, 214, 334

Ilyushin: 76, 86, 96, 114

Yakovlev: 40, 42

Beriev: 200

and helicopters:

Mi 8, 14, 17, 24, 28, 26

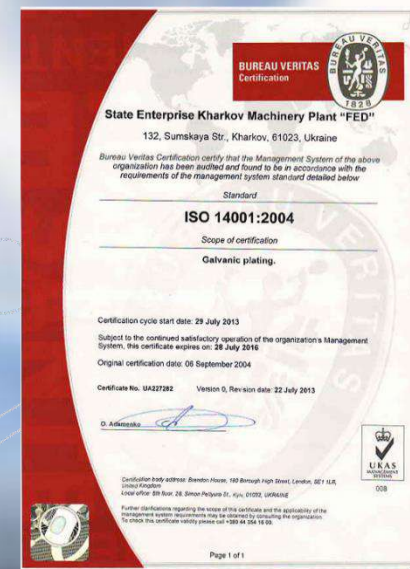
Kamov 27, 28, 29, 30, 31, 32, 50, 52,

operated in more than 60 countries.





Quality Management System

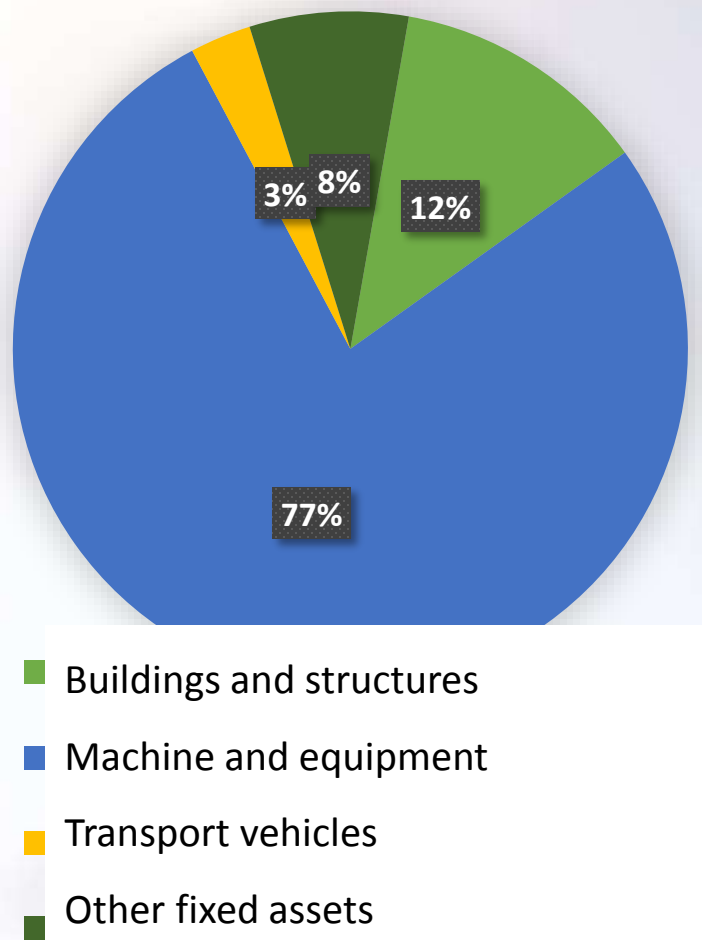


The quality management system of "FED" has certificates of compliance with ISO 90012008, ISO 9100: 2009, ISO 14001 from Bureau Veritas Quality International.

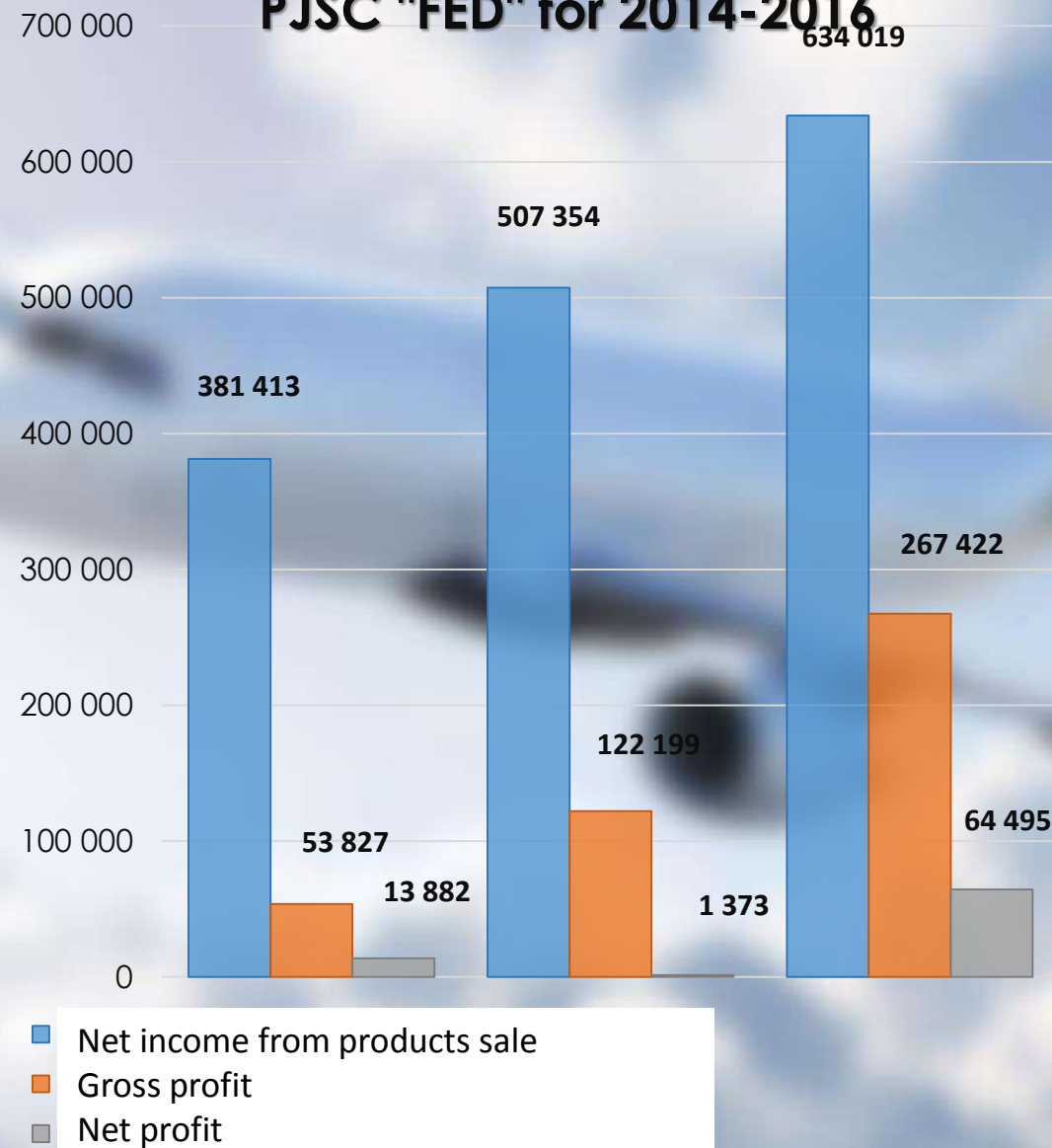


Activity

Structure of fixed assets of PJSC "FED" in 2016

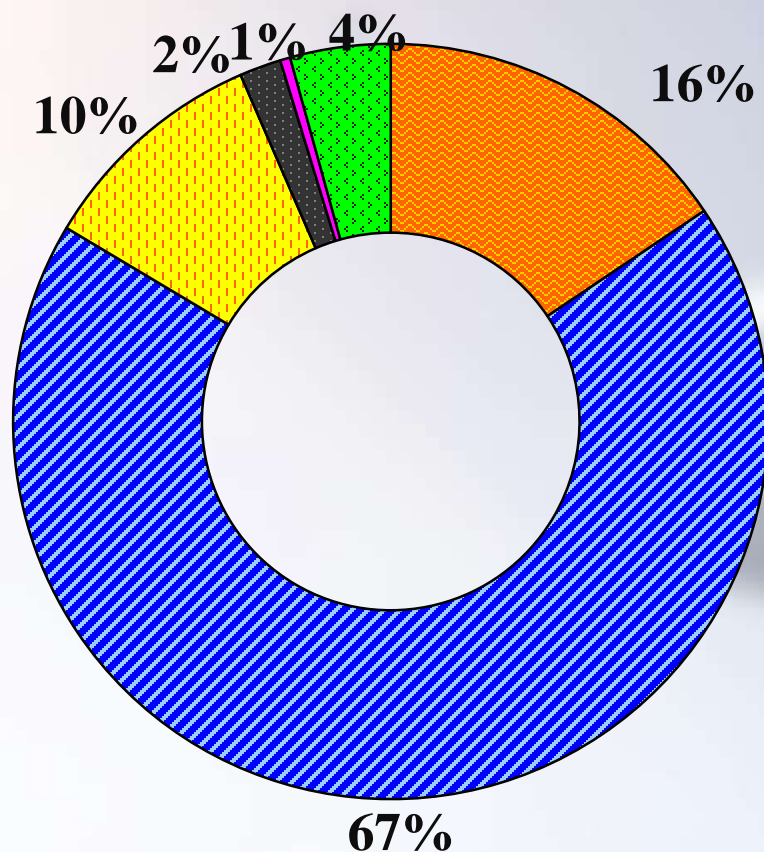


Dynamics of financial results of PJSC "FED" for 2014-2016





Capital Investments



- Capital construction
- Purchase of equipment
- Purchase of other fixed assets
- Purchase of non-current tangible assets of low cost
- Purchase of buildings
- Purchase of transport vehicles

For the production of competitive products in the world market, PJSC "FED" constantly carries out the technical re-equipment of production. Currently, the company acquired new machines, special coordinate measuring machines, machining centers, the manufacturers of which are the leading machine-building enterprises of Germany, Switzerland and the United Kingdom.



Training of Specialists

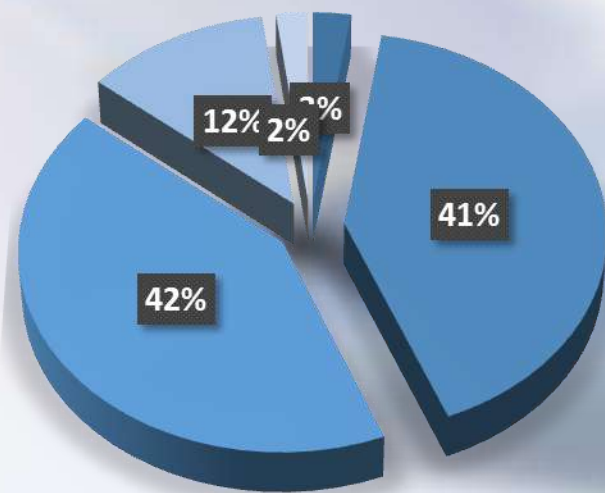
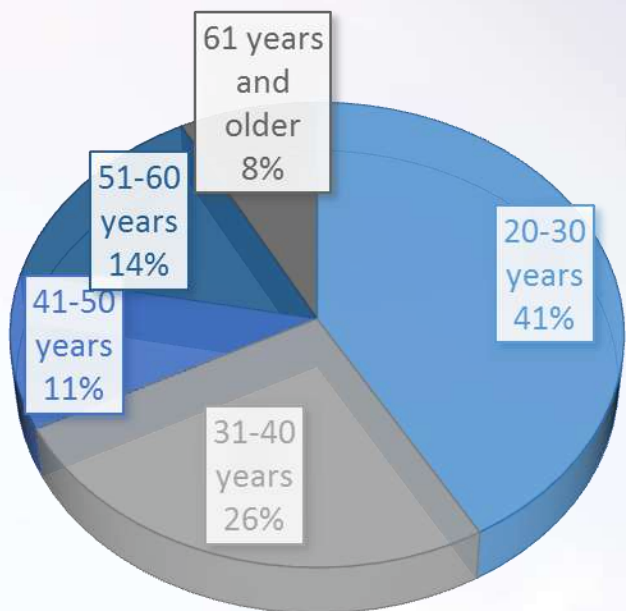


One of the important factors for the success of any production is the availability of qualified personnel. To solve personnel problems, the department of aggregation of the Kharkov Aerospace University (KhAI) as well as other branch higher educational institutions has been opened at the "FED". Training of students by leading specialists of the enterprise in combination with production practice allows to prepare competent engineers and technologists. The company employs 2 academicians, 5 doctors of science and 9 candidates of science.

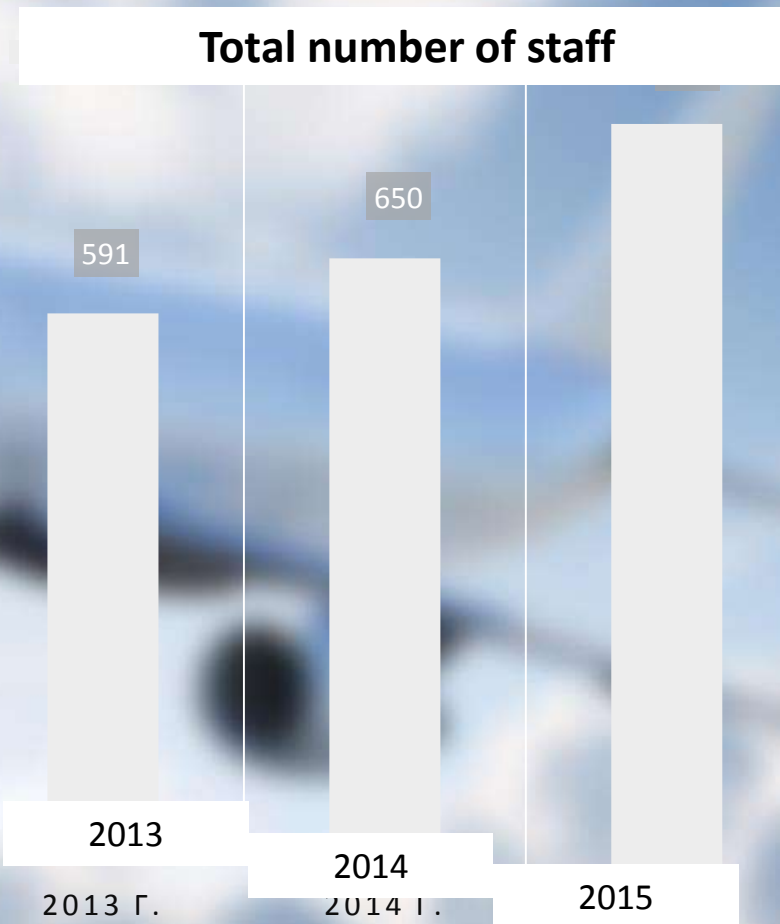




Human Resources



- Company's management
- Engineering & technical Staff
- Major personnel
- Auxiliary personnel
- External staff:



One of the important factors for the success of any production is the availability of qualified personnel.



Innovative regional aerospace cluster "Mechatronics"





Cluster Participants

Companies



PJSC "FED"

SE "ANTONOV"

MOTOR SICH JSC

State Enterprise "ZMKB" Progress "

State Enterprise "KhMZ" FED "

State Enterprise "NAKV"

KSAMC

PJSC "HARTRON"



SNNP "Association" Kommunar "

NT SKB "POLYSVIT"

State Enterprise "Chuguevsky Aviation Repair Plant"

PJSC "Dnepropetrovsk Aggregate Plant"

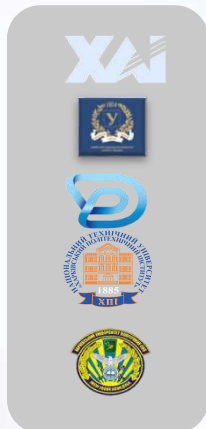
State Enterprise "OKB AON"

OOO OKB "SCREEN"

IRE NASU

PJSC "PRIVATBANK"

Educational Institutions



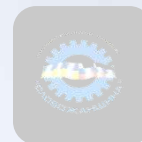
NAU "HAI"

KhNU named after V.N. Karazin

KhNURE, NTU "KhPI"

KhUVS n.a. I. Kozhedub

Design and research organizations

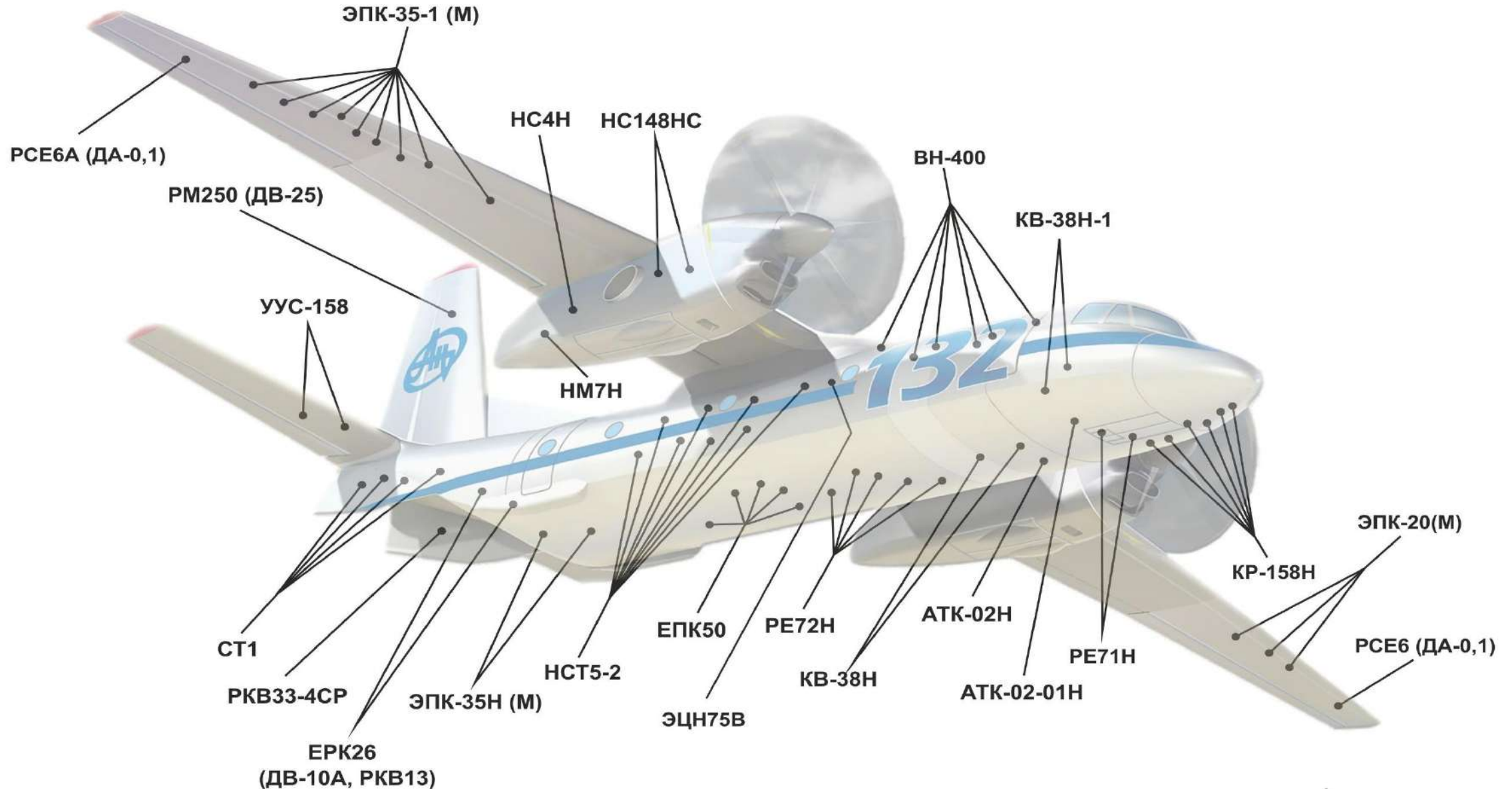


Technopark "Slobozhanshchina"

Science park "FED"



Completion of the Aircraft An-132D with units designed by aerospace cluster "Mechatronics"





FED products for civil and transport aircraft



An-148



Steering gear RM-140



FLIGHT MANAGEMENT

ARM-19H - multifunction spoiler drive



KPM148N - slats and flaps drive

**ARP-20H - elevator drive
ARP-21N - rudder drive**



AP10 - aileron drive

**Stand-alone, combined, complex electrohydraulic actuators with a force of up to 160 kN;
Electromechanical drives with a force of up to 40 kN and torque on the shaft up to 220 Nm**

**Operational life of aggregates: more than 20 000 hours.
Service life: unlimited.**



FED products for civil and transport aircraft



Plunger pump NP148N



Electric drive pump station HC-140



Pumping station NS-148



Hydro accumulator GGA-800

Adjustable and unregulated axial-plunger pumps with a feed rate of 2 to 200 l / min at a pressure of up to 38 MPa; Hydraulic motors with torque on the shaft from 2 to 150 Nm;

HYDRAULICS



Switching on crane KV-38N



An-148

**Operational life of units:
more than 20 000 hours.
Service life: unlimited.**



FED products for civil and transport aircraft



Air Bypass Valve Control
Unit
AUCPV-MS2



Electric centrifugal pump
ETSN75V



Control unit of the input
guide device AUVNA-
MS2



ELECTRIC DRIVING VALVE
EPK-35



PUMP – DOSIN UNIT - ND-MC2T

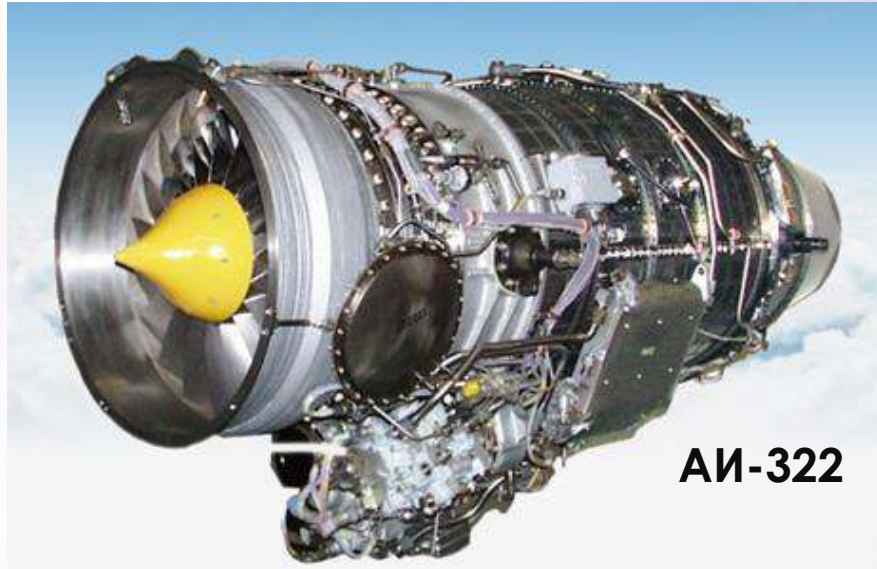


ELECTRIC DRIVING VALVE
EPK-20

Operational life of units:
more than 20 000 hours.
Service life: unlimited.



FED units for AI-322

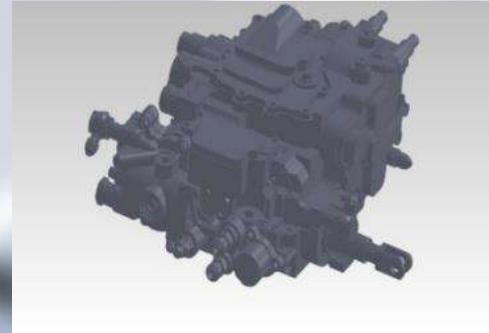


AI-322

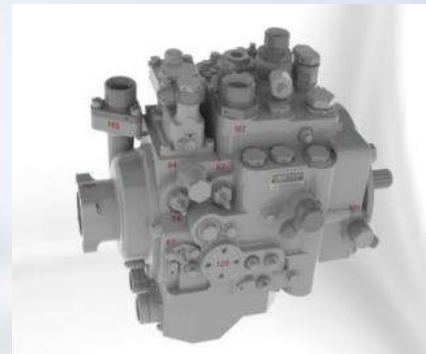
FADEC (full responsibility of managing fuel consumption and mechanization of the compressor)

Dual-mode hydro mechanical reserve for fuel consumption

All-mode hydro mechanical reserve for the mechanization of the compressor



Pump-metering device of fuel NDT42



Guiding device control PHA 42 -1



FED units for boost engine AI-322F



Centrifugal pump
DCN42



Pump fuel HT40



Regulator of guiding
vehicles PHA 42



Aggregate of fire
track AOD42



Nozzle regulator
PC42



Fuel dispenser DF42



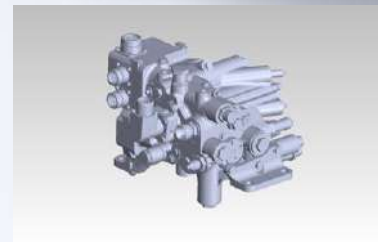
AI-322F



Fuel pump HT12



Fuel pump HT4



Fuel metering unit ADT42

Testing in TBC is performed
Stand and flight tests of the engine are in progress

FADEC (full responsibility for controlling the consumption of main and afterburner fuel, compressor mechanization, control of the all-purpose nozzle)

**Dual-mode hydro mechanical reserve for fuel consumption
All-mode hydro mechanical reserve for the mechanization of the compressor
Safe afterburner shutdown**



FED for SEDRI PRC engines



Manufacturing of details of experimental pumps
HP17C, HP170
Stand testing of pumps HP17C, HP170



Pilot pumps ZC-12A are manufactured
Bench tests of the pump ZC-12A

**Conceptual design of the automatic control system is fulfilled:
Mathematical modeling of aggregates
Distributed architecture FADECs
Pump-regulator with all-mode intelligent reserve
The electronic standby unit is integrated in the pump regulator
Special mathematical model for backup management
Protection against high-energy electromagnetic radiation**





INTERNATIONAL LABORATORY OF AIRCRAFT ENGINE CONTROL SYSTEMS (ILECS).

Dynamic MM of high level

Onboard MM of high level

High-temperature automatic control system CU15

SPU of high resistance to WWF

High-power ACS

Integrated ACS "aircraft-engine"

Adaptive ACS "intelligent" engines

ACS "electric" engines "electric" aircraft

Engine Health Management Systems



FED products for helicopters

automatic control
system of engines



PUMP-
REGULATOR
HP-3BM-T



Executive
mechanism IM-3A



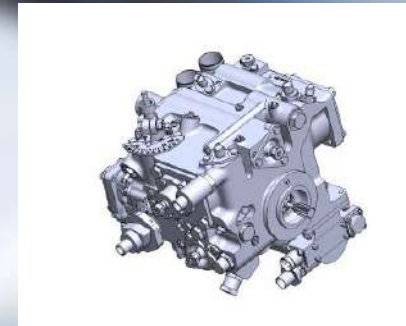
PUMP-REGULATOR
HP9V



METERING PUMP
ND-450



Ми-28



FUEL METERING
PUMP NDT-500

**Operational life of aggregates: more
than 6 000 hours.
Service life: unlimited.**



FED products for fighters

ENERGY SUPPLY



DRIVE GENERATOR GP21



VANE DRIVE PGL 40-2

**Operational resource of units: more than 5,000 hours.
Service life: unlimited.**



DRIVE GENERATOR GP25

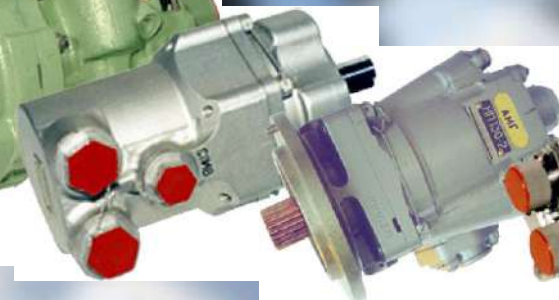
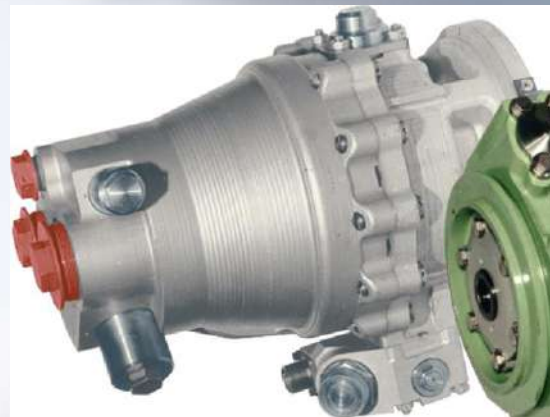
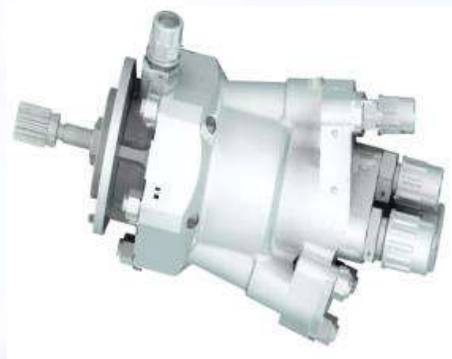


HYDRAULIC PUMPING
UNITS HC58



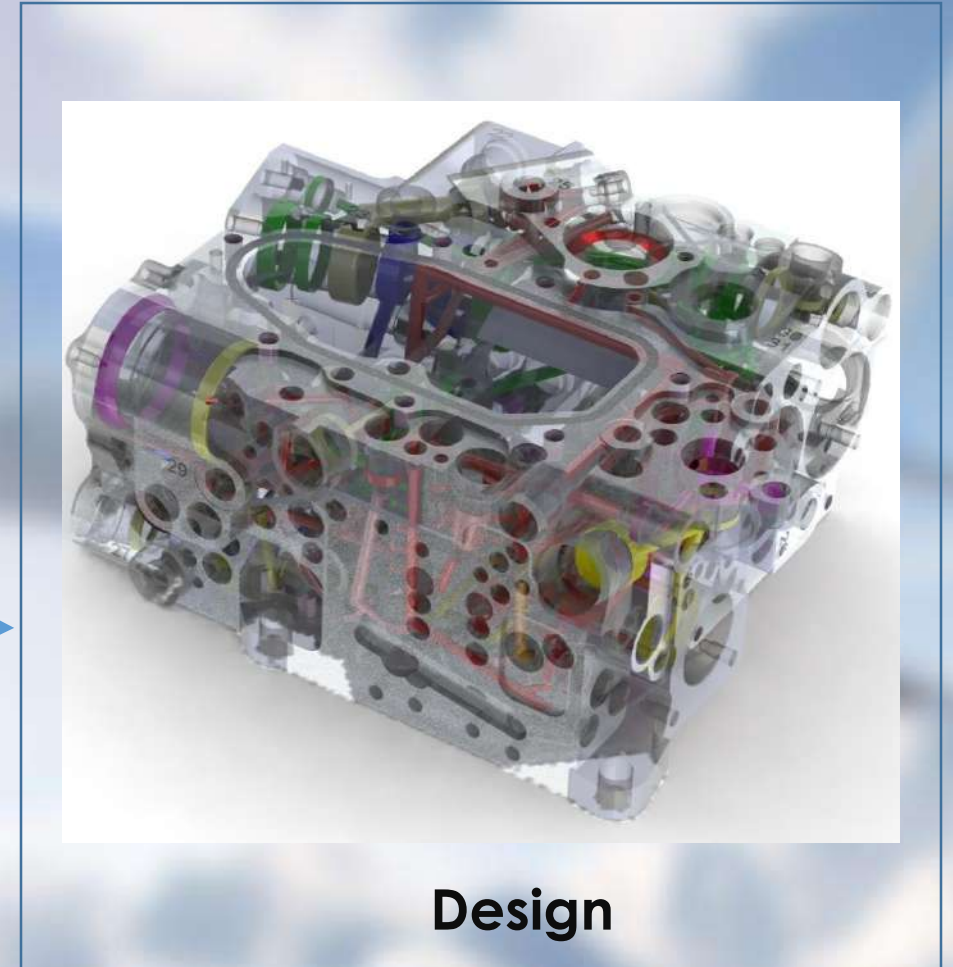
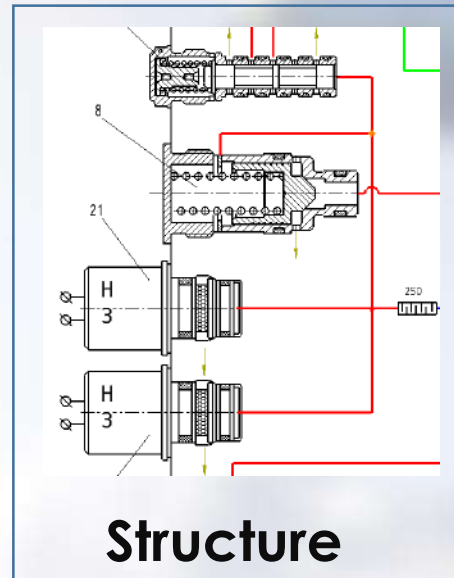
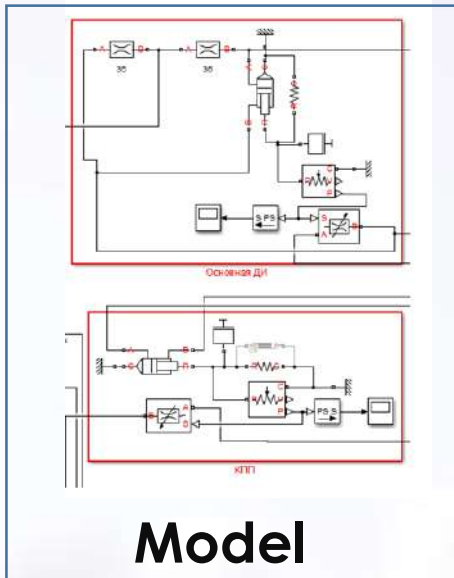
PLUNGER PUMP HP30

Pumps



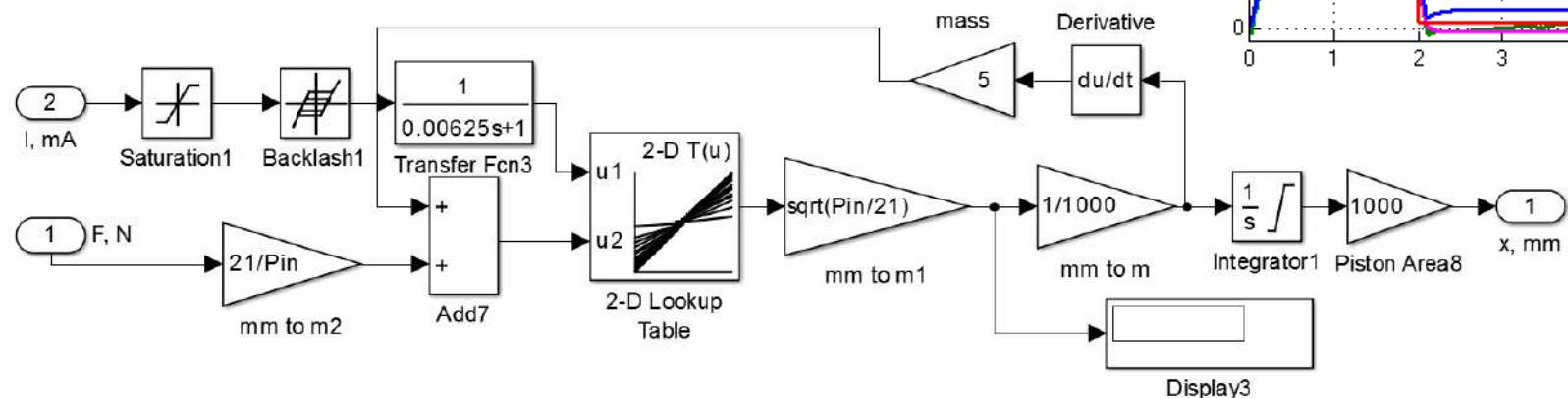
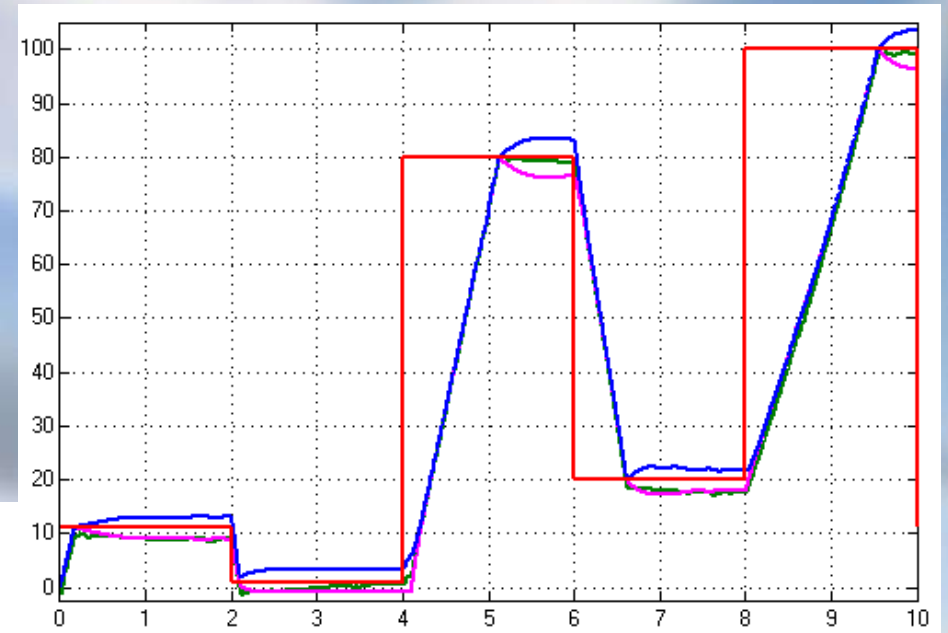
Dynamic models of aggregates

Dynamic models of high-level aggregates as a tool for analysis in selecting the scheme of the unit and the elements of the system. The database of models of basic typical elements is created.

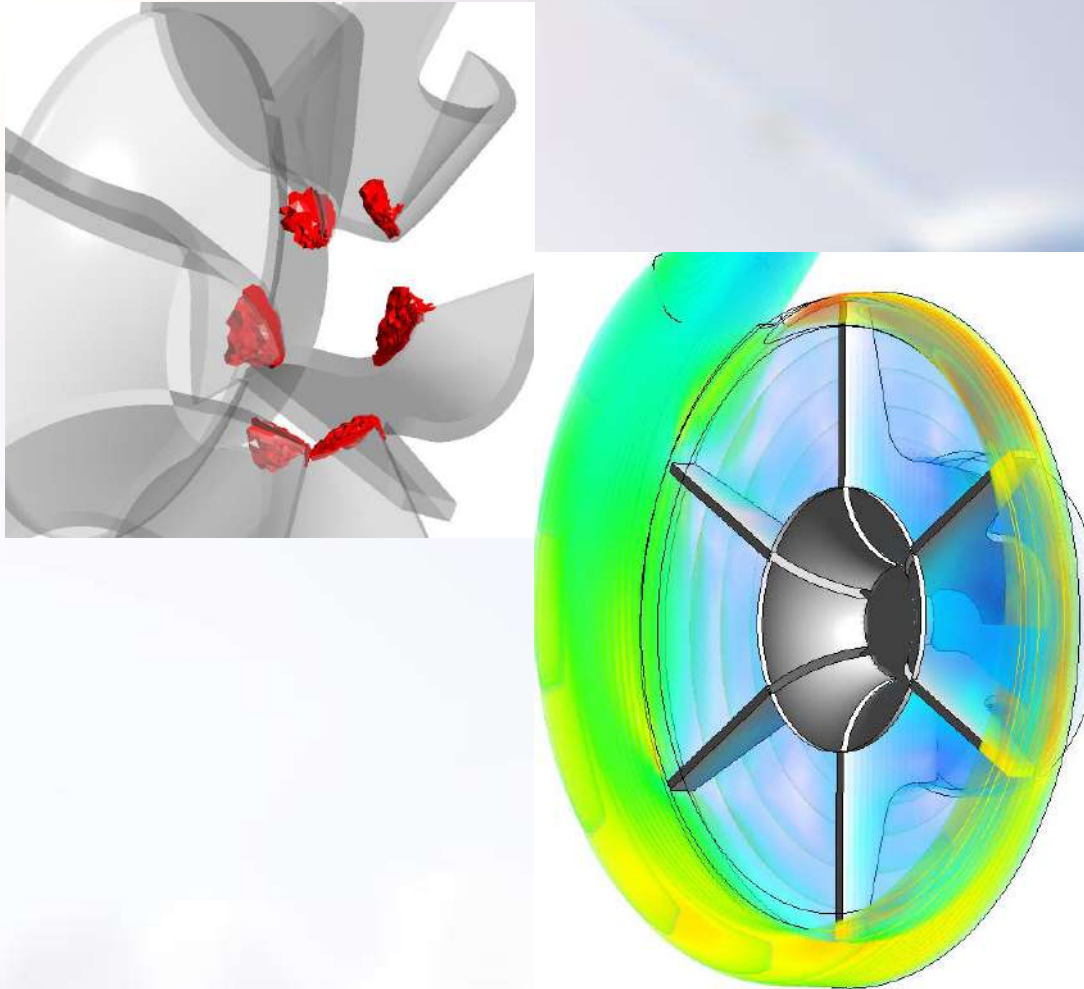


Fast-calculated dynamic node models of aggregates

- accounting for nonlinearities of various kinds;
- closure of feedback circuits;
- selection of regulator parameters;
- application of models in the structure of automatic control systems.

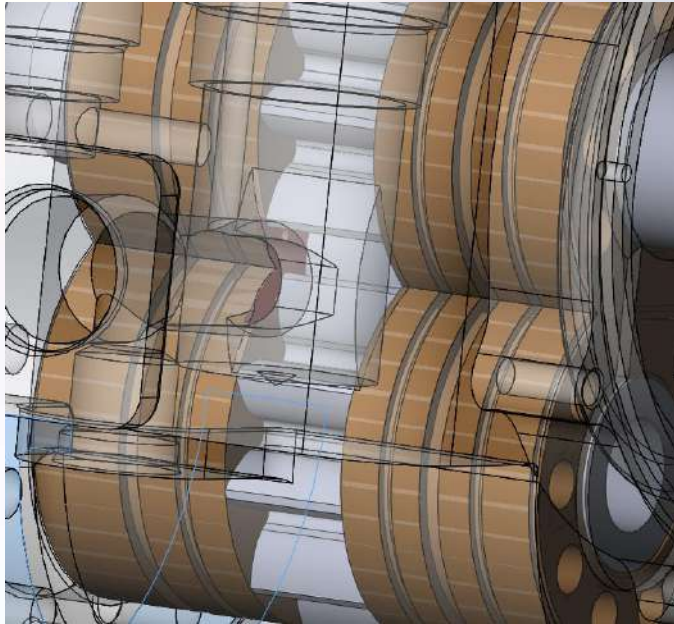


Centrifugal Pumps



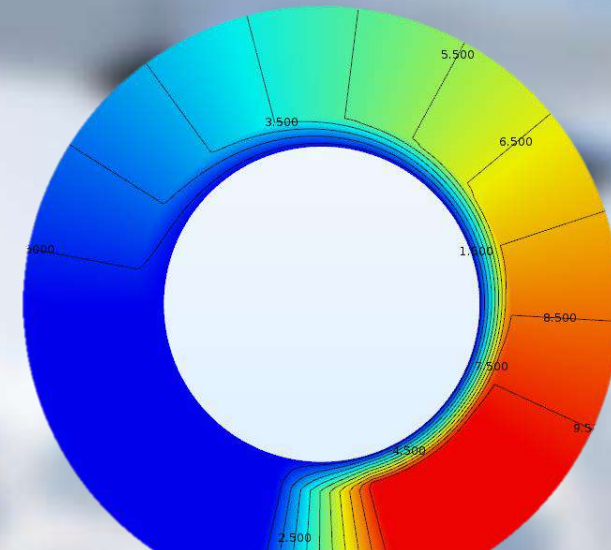
- generalization of characteristics of standard designs of blade machines, use of similarity theory in the development of new products;
- calculation of cavitation and pressure characteristics by analytical methods and in CFD packages;
- design of output devices (snails of diffusers);
- profiling blades using CFD packages.

Gear Rotary Pumps

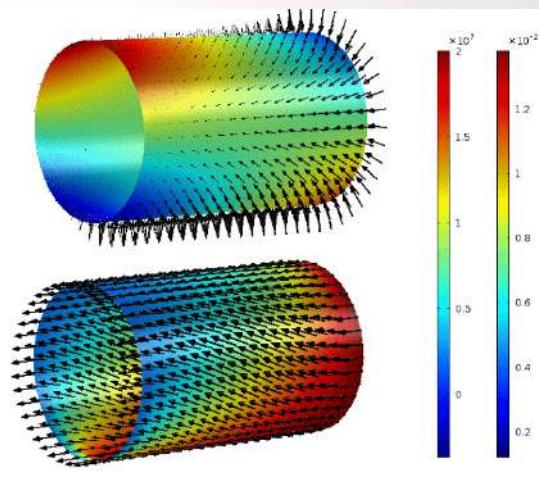


- calculation of end-end devices;
- calculation of input and output profiles using CFD packages;
- calculation of plain bearings operating at different friction modes;

- use of wear-resistant coatings;
- heat removal from friction pairs.



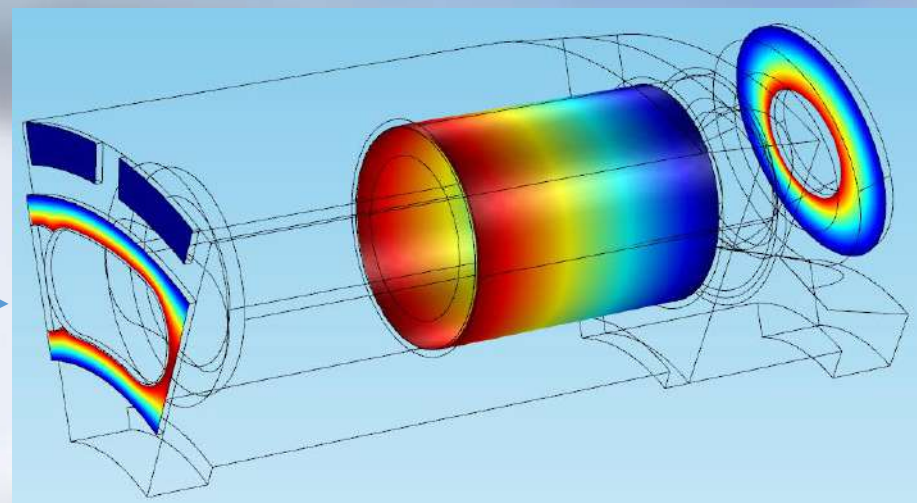
Axial-plunger fuel pumps



Specific pressures

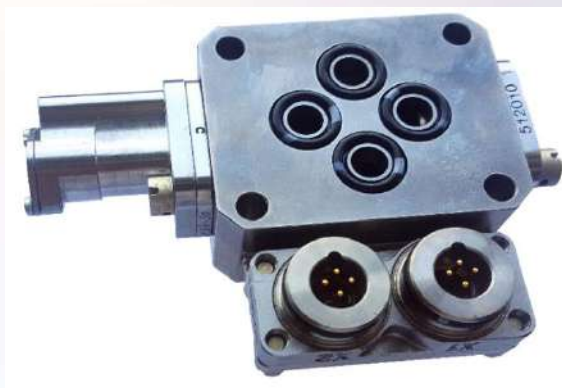


- analytical calculations;
- hydrodynamic calculations by CE method;
- creation of dynamic nonlinear models.

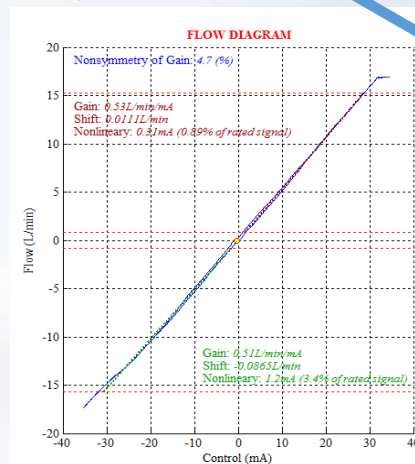
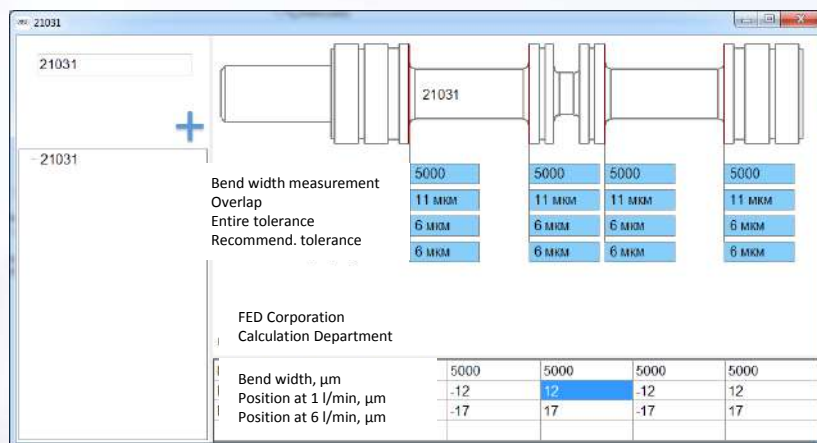


Flow of fluid in the gaps

Electrohydraulic two-stage converters



- software complex for calculating power amplifiers with a high-level model;
- adjustment of the parameters of the preliminary cascade with a spool valve;
- program assistants in technological operations.





Electrohydraulic converters of rotary type with direct drive from electromagnet RDDV

- calculation of unloading of the rotary flat valve;
- calculation of a flat torque motor;
- Studies to achieve dirtiness are higher than in two-stage amplifiers due to the use of flat spools and high forces due to the torque motor;
- high-level mathematical model.



Flat valve
spool

Momentary
engine with
integrated
sensor





Plasma Precision Nitriding

The Scientific and Technological Center "Nanotechnology" (Kharkov) in close creative cooperation with the Public Joint Stock Company "FED" (Kharkov) specializes in the field of fundamental and applied research on the development and practical implementation of multicomponent coatings for various functional purposes (mono- and multilayered, nanostructured, gradient) to improve the performance characteristics of materials, machine components and parts, cutting and forming tools, and also in the field of technological development their specific processes and technologies based on the modification coating during deposition from the gas phase (CVD processes) ion-plasma and plasma-chemical processes (PECVD-process), and equipment for its implementation.





Nanocoatings

Essentially new (PVD and hybrid PVD + CVD) processes are developed:

controlled formation of multicomponent nano- and microlayer coatings in the systems "metal-nitrogen" and "metal-carbon" using vacuum-plasma (PVD) and plasma-chemical (CVD) methods.

a) "Hard and super hard coatings" on a nitride base in the systems "metal-nitrogen" multilayer (Ti, Mo, Zr, Cr) N, Ti-Al-N, Ti-Mo-N, Zr-Ti-N, etc .;

on a carbide basis in the "metal-carbon" systems -

- › monolayer and multilayer TiC,
- › monolayer Ti-C-N,
- › nanolayer TiC-TiN,
- › nanolayer TiC-C,
- › monolayer MoC,
- › monolayer Mo-C-N,
- › nanolayer MoC-C,
- › monolayer TiC: H, nanolayer TiC: H-TiN,
- › Nanolayer and multilayer TiC-C: H,
- › mono-layer MoC: H,
- › nano-layer MoC: H-TiN,
- › nanolayer MoC: H structures;

b) "Metal-metal coatings" - metal multilayer PVD coatings of Mo, Ti, Zr, Nb, Cr, Ni;

multilayer PVD coatings based on Cu-Mo-N; multilayer PVD coatings based on (Cu-C) (with different carbon content);

c) antifriction coatings based on molybdenum disulphide with additives of copper, titanium nitride, etc., obtained by magnetron and CVD methods.



Our developments are protected by patents