



**«INNOVATION DRIVEN
BY TRADITION»**

**GANZ ENGINEERING AND ENERGY
PRODUCTION MACHINERY LLC.**



**EQUIPMENT AND SERVICES
FOR
NUCLEAR POWER PLANTS**

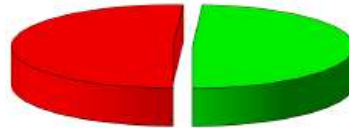


COMPANY PROFILE, KEY FACTS

Ganz Engineering and Energy Production Machinery Ilc. (Ganz EEPM Ilc.) is a Hungarian-Russian joint venture with a strong portfolio in engineering and manufacturing of machines for NPP. The company produces fuel handling manipulators, powerful circulation pumps and valves for nuclear power plants.

Established in: 2008
Number of employees: 120
Company form: LLC., owned by companies:

Atomenergomash (Russia)
(51 %)



Ganz Holding Zrt.
(49 %)

Ganz Machinery Works Holding was one of the largest machinery works in Hungary, the products of which are related to power generation, water supply, management of water resources, urbanization and environmental protection. Its subsidiaries are also subcontractors for leading western companies.

Atomenergomash Holding, the machinery division of Rosatom is one of the leading suppliers of efficient technological solutions for nuclear and thermal power plants, as well as for enterprises of gas and petrochemical industry in Russia and abroad. Atomenergomash group includes 50 Russian and foreign companies with unique technological and manufacturing expertise with a strong industrial base.



HISTORICAL FACTS

- Ganz Engineering and Energy Production Machinery llc. and its predecessors have won recognition with their activities over the past 170 years.
- The company was founded in 1844 by Swiss foundry man Ábrahám Ganz. He was the first in Europe to invent and produce durable railway carriage wheels using hard casting technology.
- Since then famous engineers and inventors have made the Ganz companies great:
- Well known inventor Nikola Tesla worked for Ganz in 1880-82
- The world patent of Miksa Déri, Ottó Bláthy and Károly Zippervnovszky in 1885 enabled transformer-based electric energy distribution and transmission.
- Kálmán Kandó's phase-change electric locomotive and György Jendrassik's diesel locomotive brought about a breakthrough in railway traction.
- The Ganz companies made machines, vehicles, hydro-machinery, ships, port cranes, oil industry equipment and many other products in the past 170 years.





MAIN PRODUCTS AND SERVICES

Engineering, manufacturing, commissioning and maintenance of

- Nuclear fuel manipulators
- Large-scale custom-built water circulation pumps,
- Pumps for water intake plants and water supply systems
- Complete delivery of mechanical and electrical subsystems





ENGINEERING AND PRODUCTION BASE

Ganz has gained rich experiences in engineering and manufacturing of energy production machinery in the past 100 years, which enables the company to fulfill the high requirements of nuclear industry.

- Product development and design CAM and CAE software - SolidWorks 3D, SurfCAM, Ansys). The system is integrated with the EPDM product-documentation system and the SAP ERM system.
- Full range of machines tools, horizontal milling and boring machines etc.



FUEL HANDLING MANIPULATORS

- The first complete nuclear power plant fuel handling machine for VVER reactors was manufactured by Ganz in 1980.

- Since then 22 complete units have been produced for NPP with VVER-440 and VVER-1000 type reactors in Hungary, Russia, Czech Republic, Germany, Slovakia, Bulgaria, Ukraine.

- Ganz has created a special testing facility for the comprehensive testing of the entire machines.

- The fact, that Atomenergomash Group acquired a controlling interest in the company in 2008 it has caused a significant strengthening of the nuclear power plant profile, the appearance of new markets and the opportunity to use state of the art developments.



FUNCTION OF FUEL MANIPULATORS

- The main functions of the fuel handling manipulators manufactured by Ganz are: moving of fresh and spent fuel elements, clusters and hermetic bottle covers, opening and closing hermetic bottles, visual inspection of the fuel assembly heads and beds, visual monitoring of the manipulation operations.
- The development of the machines has primarily focused on safety, increasing reliability, reduction of fuel handling time, and increasing the maintenance cycle duration. As a result of these the costs of safe energy production drop and the annual production capacity increases.
- In the interest of achieving these objectives the drive constructions used today meet the requirements of the NUREG, ANSI and other standards. The elements used in their construction only come from top companies with wide nuclear power plant references, e.g. Stromag, Lenze, SEW –Eurodrive and Honeywell etc.





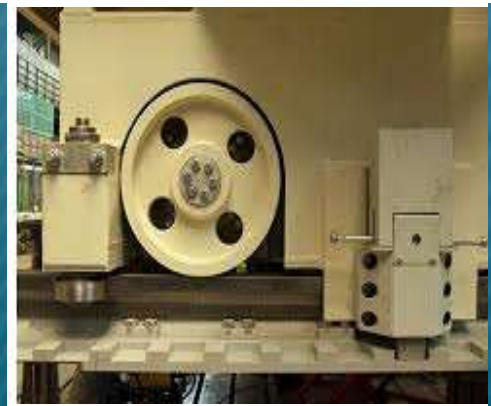
NEW DEVELOPMENTS

- Starting from 2003 Ganz has been developing and manufacturing a brand-new design of FHM that is able to handle both types of fuel assembly supply for both VVER 440 and VVER 1000 reactors.
- Ganz is performed modernisation of the manipulators for fuel assemblies and developed various observation and handling tools related to fuel reloading technology used in nuclear power plants including sipping systems that allows tightness control of fuel rod cladding.
- Through the Atomenergomash Group Ganz gained access to new markets and development opportunities. The company had the opportunity to join in the development of the fuel handling machines designed for new Russian-V-491 and V-392-M type reactors.



FUEL HANDLING MANIPULATOR FOR LENINGRAD 2 NPP

- Ganz manufactured in 2013 parts – bridge, rails, drives and other parts for fuel handling manipulator in cooperation with the Atomenergomash partner company «OKBM Afrikantov»
- Besides the basic functions for handling of nuclear fuel, the machine controls the tightness of Fuel rod claddings. In addition, the machine is equipped with its own television system that allows operator to observe in real time the process of refueling. The TV system shows a general overview of the work of the machine in the hall.
- The manipulator has an optimized control system that allows significantly reduce the rate of loading and reloading of nuclear fuel saving time and money. The new manipulator fulfills the post Fukushima requirements in seismic safety.



PUMPS

The first pumps made by Ganz were manufactured in 1860. Since then Ganz has produced and shipped many thousands of different pumps, pumping units and complete pumping stations all over the world. The tailor made, custom designed pumps – medium and large size axial, mixed-flow, double-suction pumps are designed for cooling systems of NPP (0.1$Q$$20$ cubic m/sec,

Product range of pumps for NPP

- Cooling water circulating pumps for NPP and industrial systems
- Hot water supply for industrial use, district heating etc.



PUMPS FOR ROSTOV AND BELARUS NPP

- Ganz EEM supplies pumps for nuclear power plants and pump-turbine machine groups for Heller cooling system for thermo power plants all over the world.
- In 2012 and 2013 Ganz delivered 18 pumps type MPB2200 and BvDF-600 for the unit № 3 and 4 of nuclear power plant in Rostov, Russia.
- The total weight of the 18 giant pumps is over a hundred tons and they have the combined capacity of transporting 17.5 cubic meters of water per second. The power of each electric drive is 4,5 MW. The pumps are completed with prerotation system which enables power regulation.
- In 2013 there were manufactured 6 pumps type DBNe500 to the South-Ukraine NPP
- In 2015 a batch of 4 powerfull BPC-1800 circulation pumps will be delivered to the Belarus NPP and 4 other pumps next year.
- The design and manufacturing of the pumps can be attributed to expertise by engineers and other professionals of Ganz.



TURBINES

The custom-made, individually designed turbines originates from the knowledge and experience of the Ganz engineers and researchers as well as from modern, scale-model testing facilities.



Ganz supplies Pelton, Francis and Kaplan turbines as well as all types of axial-flow hydro-power units (bulb-, pit- and S-type turbines). The output of our turbines ranges from 50 kW to 50 MW.

- Power range
- Kaplan 30 kW-10 MW
- Francis 50 kW-32 MW
- Pelton 50 kW-50 MW



VALVES



- Ganz offers valves for several purposes and fields of application.
- The design, manufacture of valves corresponds with the size and pressure range.

BATTERFLY VALVES are of double excentricity which better meets the increasing requirements. Their lenght of installation, flange connection and drive connection correspond to the relevant DIN standards lenght eccentricity



CHECK VALVES are featured by reliable and troublefree operation, long service life, tight closure, low maintenance and low hydraulic resistance



FLAP VALVES The flap valves are of welded construction with flange connections. For flap valve casing is provided rubber cord packing

HYDRO MACHINE PERFORMANCE TESTING STATION

- Increasing demand for large pumps stimulated Ganz to build a new pump testing station that has been put into operation in 1987 and renovated in 2014. This is the largest pump performance testing station in Central-Eastern Europe with water volume in the basin of 1500 cubic meters and flow range 0.15-11.0 cubic meters of water per second.
- The other operational parameters of the machine like vibration, noise, temperatures can also be measured by suitable instruments during the performance tests. The pumps are driven usually by their own motors but occasionally other drives can also be applied. Pump-turbine machine groups for Heller-Forgo cooling system can be tested with full speed. Prototype turbines of power less than 1.6 MW are also tested here.
- Main parameters:
- Area of the Hall: 1250 m²
- Water volume in the basin: 1500 m³
- Crane capacity: 50 tons
- Flow range 0,15-11 m³/s
- Power supply for the units at

0,4 kV	400 kVA
6,0 kV	2500 kVA
10,0 KV	3500 kVA





GANZ AND PAKS NPP II

Ganz and its predecessors have delivered high quality equipment for Paks NPP: 2 fuel handling manipulators for VVER-440 (V213) reactors, MJO pumps, TVV221 generators and many other machinery products.

Ganz with its experience in engineering and manufacturing can play a significant role in designing, producing and delivering key equipment for NPP Paks II: FHM, wide range of pumps and other equipment, among them:

- Welded pipelines constructions
- Boilers
- Heat exchangers
- Non standard equipment etc.





REFERENCES

- Ganz has manufactured 22 fuel handling machines (FHM) for VVER-440 and VVER-1000 Pressurized Water Reactors since 1980 for Hungary, Bulgaria, Czechoslovakia, Czech and Slovakia, Ukraine, GDR, Soviet union and Russia
- Ganz has shipped thousands of different pumps, pumping units and complete pumping stations all over the world. A significant number of pumps have been delivered to Paks NPP and Rostov NPP



INNOVATION DRIVEN BY TRADITION

Innovation in Ganz is based on the know-how of our experienced engineers. Several years of development has resulted in a new type of double suction pump with a welded casing, which helps cut down production time and costs. This product received the Hungarian Industrial Innovation Grand Prix Award in 2009 and the Hungarian Quality Product Grand Prix Award in 2012.

The last innovation is a container-installed mini hydro powerplant which is suitable for industrial or residential electricity supplies in areas where there is no electric network, or the objective may be to replace an existing expensive supply with a cheaper system based on an available hydro power source.

