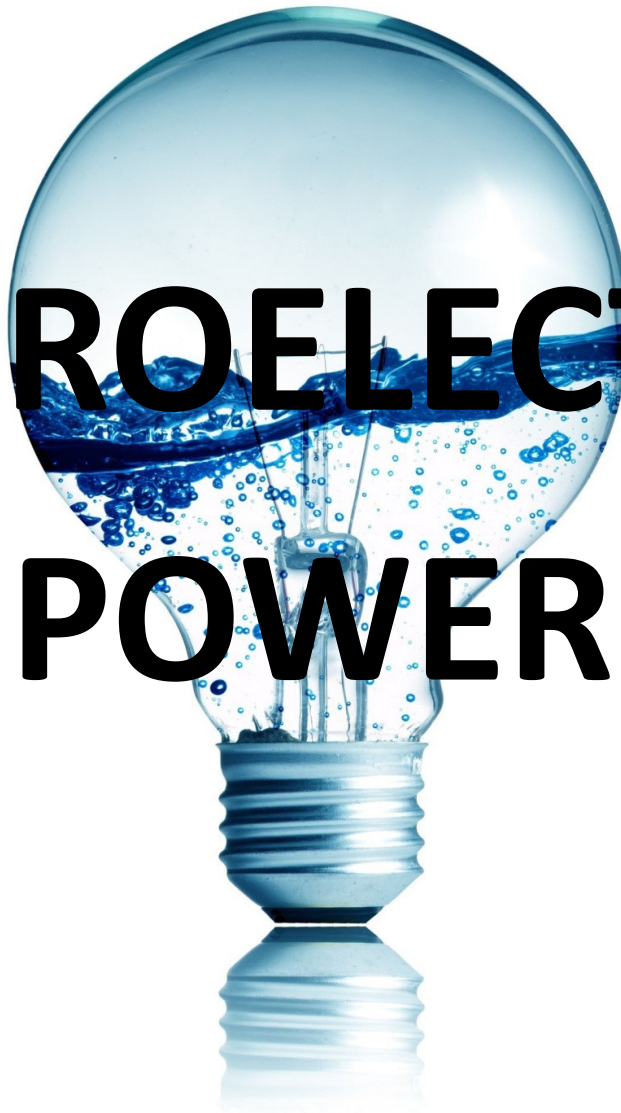




HYDROELECTRIC POWER





The companies of Italtechnics network have acquired a long experience in the hydroelectric plants, developed as part of a solid partnership with the main power generation companies in Italy.

The acquired skills, allow us today to address both the production or the complete revamping processes of the whole hydroelectric power station.

The network proposes a complete service going from a feasibility study ,to design, realisation, installation and after-sales assistance.

We manage all the necessary processes inside the network (only the civil works are supplied on site). Every single aspect is followed directly by a specialist of our companies and the detailed monitoring of all the processes, guarantees maximum reliability.

We can offer the craftsman's accuracy and flexibility combined with the capabilities of the big industry.

In The network we add our skills and competencies, but not our costs.

That means that We can offer the best solutions at the right price because we combine our elevated expertise and know-how, with the remarkable competitiveness that comes from streamlined and extremely dynamic and flexible company structures.

SPECIFIC KNOWLEDGE IN THE HYDROELECTRIC FIELD

The profound knowledge of the hydraulic machines and the electro-instrumental equipment, is an element that distinguishes the companies of this sector, in Terni area that represents a pioneering territory, at national and international level, as regards the production of electricity and the development of related technologies.

This extensive experience gained over the years, allows today as well a joint design development to propose innovative solutions in terms of alloys, construction models, materials, alternative components, etc.; moreover, it is possible to devise, study and make specific equipment and infrastructures to speed up operations at the power plants and workshop processes, improving the quality of their execution. All of this is done not in the perspective of execute a single project, but with the aim to be replicated on a large scale.

An acclaimed experience of the companies participating in the network is their knowledge of the components of the individual power plants and of their performance parameters if installed on different types of power plants; activities in which the network is investing to increase its know-how and improve its offering in more advanced and innovative ways.



Close collaboration with Universities and Research Center, allows the network to offer high added value services to their clients; for example, we can improve maintenance parameters such as

Mean Time Between Failure (MTBF) as well as Mean Time To Repair (MTTR); parameters that, if appropriately included in the RAMS (Reliability, Availability, Maintainability and Safety) analysis of critical components, will definitely improve the production and profit performance of the power plant.

A sector of particular interest to the network is represented by small / medium hydroelectric power plants, in order to produce electricity from small tributaries, sewage plants, irrigation dams, residual water ducts, etc.

The network companies dispose of the design and production capabilities to work on a specific supply of "tailor-made" power plants, meeting the needs of sustainable energy production, now increasingly demanded by a growing number of customers, both private and governmental.

SPECIFIC ASPECTS OF CONTROL PANELS

The technology used in electrical panels MCC (Motor Control Center) and PMCC (Power Motor Control Center) is based on extractable drawers which allows, upon the occurrence of faults on electrical power supply of motors, the replacement of the entire starting circuit, power supply and monitoring circuit, by simply replacing the damaged drawer with an equivalent one (obviously run in stock); this can be made by avoiding the out of service of the whole electrical panel and allows the normal plant operation for the components not involved by the fault.

All this guarantees reduced downtime to a minimum, because with a careful stock of extractable drawers as "spare parts", as indicated by the manufacturer of the MCC, the customer is able to recover possible shutdowns, in complete autonomy and really very short times, without the help of the manufacturer of the electrical panel.

The network companies are able to provide switchboards PMCC, both fixed drawers or extractable ones, starting from the design of the specific needs of the client up to the development of multiple configurations, both in terms of power and overall dimensions, by succeeding, through a careful design CAD / CAE, to minimize the necessary dimensions.

The main features of the product Electrical Panel, in addition to a great strength and mechanical reliability, guaranteed by the main structure made in ALUZINC 20/10, can be summarized as follows:

Nominal Voltages

- | | |
|--|---------------|
| • Nominal Impulse Withstand Voltage (Uimp) | 9.8 kV / 8 kV |
| • Nominal Isolation Voltage (Ui) | 1000 V |
| • Nominal Operating Voltage (Ue) | 690 V |



Nominal Current

Main Horizontal and Vertical Bars

- Nominal Current (In) up to 8500 A
- Nominal Peak Current (Ipk) up to 330 kA
- Nominal Short-time Current (Icw) up to 150 kA 1 sec

In addition to the above, it should be pointed out that our electrical panel, thanks to the use of Aluzinc (steel bars coated with an alloy of Aluminium and Zinc), is very resistant to corrosion against oxidizing agents or particular aggressive atmospheres (chemical plants, petrochemical plants, saltiness, bases, acids) for more than 60 years of operation; this data can be certified and completed with test report carried out in special climatic chambers, through cycles of more than 1000 hours in a misty atmosphere, with high salt concentration, and by analysing upon their completion, the percentage of deterioration of the structure in ALUZINC.

The electrical panels provided by the network are positioned in the upper class of the market, because in case of default (short circuit) the safety of operators is ensured by the outburst of the electric arc towards the top of the structure, thanks to the installation of special baffles that create a conduct of conveyance for the shock wave. This solution ensures that no propagation of the explosion occurs on the front, with less risk of investing any operator located in close proximity, and its extinction on the top of the framework, by means of special sealing flaps that, in the presence of an overpressure, open and determine a controlled outlet of the explosion.

Thanks to this solution combined with the segregation of the main distribution bars between each individual column of the PMCC, it is possible to ensure the integrity of the electrical panel in the columns that are not subject to the short-circuit outburst, which remain totally protected from its manifestation, except for the single column involved in the fault that must be necessarily replaced.

REVAMPING PROCESSES

We can also offer a complete revamping service for plants with important wear phenomena. In particular, the revamping processes are performed according to the following activities:

- 1) First electro-technical and instrumental survey in the power station and preliminary assessment of the status quo.
- 2) Disassembly and transport of the hydraulic and / or electromechanical components at our production sites
- 3) Disassembly, cleaning and blasting (where possible) of each device



4) Reverse engineering of the components affected by changes

During this phase are evaluated all the possible processes to be implemented in order to achieve the following objectives:

- **INCREASE OF OVERALL EFFICIENCY**
- **REDUCTION OF THE ENVIRONMENTAL IMPACT**
- **INCREASE OF OPERATING TIME**
- **REDUCTION OF PLANT DOWNTIME / FAILURE RISK AND MAINTENANCE COSTS**

5) Automation of any process involved through their control and operation by using the latest PLC generation associated with SCADA systems, that guarantee the monitoring, reporting, logging and implementation of the process in real time, from any place in the world where exists an Internet connection.

6) Adjustment and improvement of the electric power panels according to the latest technology and / or their integration with new Power Center designed according to PMCC systems (Power Motor Control Center)

7) Non-destructive testing on critical components, subjected to strongest hydraulic pressure and mechanical stresses.

8) Construction of new components and upgrading / restoring by mechanical machining of reusable components. The milling processes are performed by CNC machining centers supported by modern CAD/ CAM systems. Strict manufacturing procedures are adopted to implement scrupulous phase controls, before the final test that guarantees the conformity of the product.

9) Anticorrosive treatments and coating

10) Assembly and functional tests

11) Preparation for transport and shipment

12) Site erection and supervision during start-up of the power station

13) Production of technical documents: drawings, photos, detailed report documenting any process phase, final report with focus on interventions done, design changes and new spare parts list; recommendations for the operation and routine maintenance.

14) Customer service after start-up of the power plant, both locally and remotely, in order to provide all the necessary support for the resolution of any problem in real time and always within 24 hours.



The high number of resources available within the network, intended both in terms of operators and production facilities, the proven ability to operate in synergy, flexibility and dynamically, which are always peculiarities and strength of our companies, allow us to face the action required within fixed times of plant shut down, reduced to minimum; this thanks to the know-how acquired during many decades of revamping work performed.

LIST OF MAIN REVAMPING WORK FOR HYDROELECTRIC POWER PLANTS

OWNER	POWER PLANT	WORK DESCRIPTION
ENDESA	VISSO (MC) - ITALY	REFURBISHMENT OF PENSTOCK
ENDESA	TRIPONZO (PG) -ITALY	REFURBISHMENT OF PENSTOCK JUICE GATE
ENDESA	NARNI (TR) - ITALY	REVAMPING OF JUICE PILLAR FOR MAIN PENSTOCK GATE
ENDESA	MONTE ARGENTO (TR) / GALLETTO (TR) - ITALY	REFURBISHMENT OF TRUNCATED CONE SEAL FOR PENSTOCK DISCHARGE – REPLACEMENT OF TURBINE HYDRAULIC SEAL FOR UNIT N.5 IN PENNAROSSA
ENEL PRODUCTION	NAZZANO (RM) / PONTE FELICE (VT)/ CASTEL GIUBILEO (RM) - ITALY	REVAMPING, DISMANTLING AND REASSEMBLY OF PUMPS
E-ON	BASCHI (TR) - ITALY	CLEANING OF TRANSFORMER BARS AND VALVES ASSEMBLY
ENEL GREEN POWER	CASTEL GIUBILEO (RM) - ITALY	REVAMPING OF IMPELLER SEAT – UNIT N.1
ENEL PRODUCTION	HYDROELECTRIC POWER SYSTEM OF TERNI (TR) - ITALY	PLURIANNUAL CONTRACT FOR REVAMPING WORK, MAINTENANCE, WELDING AND MILLING OF MECHANICAL COMPONENTS IN THE VARUOIS POWER STATIONS



OWNER	POWER PLANT	WORK DESCRIPTION
ENEL PRODUCTION	COGHINAS (SS) - ITALY	REVAMPING OF PREDISTRIBUTOR WITHIN PENSTOCK AND TURBINE COMPARTMENT – REVAMPING WORK ON ROTARY VALVE, DECANTER AND PREDIFFUSER
ENEL PRODUCTION	ALANNO (AQ) / VALCIMARRA (VB) / PERIVOLI (AQ) / - ITALY	REFURBISHMENT OF PELTON AND FRANCIS IMPELLER
ENEL PRODUCTION	SALSOMINORE (PR) / AGORDO (BL) / COGHINAS (SS) / TRIANO (GR) / VARZO (VB) / ARDENNO (SO) / PIEVE VERGONTE (VB) - ITALY	REFURBISHMENT OF PELTON AND FRANCIS IMPELLER
ENEL PRODUCTION	PROVVIDENZA (AQ) / CREVOLA (VB) – ITALY	DISTRIBUTOR REVAMPING OF FRANCIS TURBINE
ENEL PRODUCTION	PIEDIMULERA (VB) / MONTE ARGENTO (TR) - ITALY	WHOLE MECHANICAL REVAMPING OF FRANCIS TURBINES
ENEL PRODUCTION	VENAUS (TO) / SAN GIACOMO (TE) – ITALY	REFURBISHMENT OF PELTON IMPELLER
ENEL PRODUCTION	SONDRIO (SO) / CEPRANO (FR) - ITALY	REVAMPING OF ROTARY VALVE
ENEL PRODUCTION	LE PIANE (BO) / VITTORIO VENETO (TV) / CENCENIGHE (TV) / SOVERZENE (BL) / BROSSASCO (CN) / FURLO (PU) - ITALY	WHOLE MECHANICAL REVAMPING OF FRANCIS TURBINES



OWNER	POWER PLANT	WORK DESCRIPTION
ENEL PRODUCTION	BORDOGNA (BG) / MORINO (AQ) - ITALY	REFURBISHMENT OF PELTON IMPELLER
CMS INDUSTRIES	SMOKTHINA 1/2 - VALONA - ALBANIA	WHOLE MECHANICAL REVAMPING OF FRANCIS TURBINE, ROTARY VALVE AND MANEUVERING SYSTEMS

SOME PICTURES OF COMPONENTS FOR HYDROELECTRIC POWER PLANTS

ELECTRICAL EQUIPMENT



Motor Control Center (MCC) & Control Cabinet

MECHANICAL EQUIPMENT



Shaft-Impeller Assembly - Francis Turbine



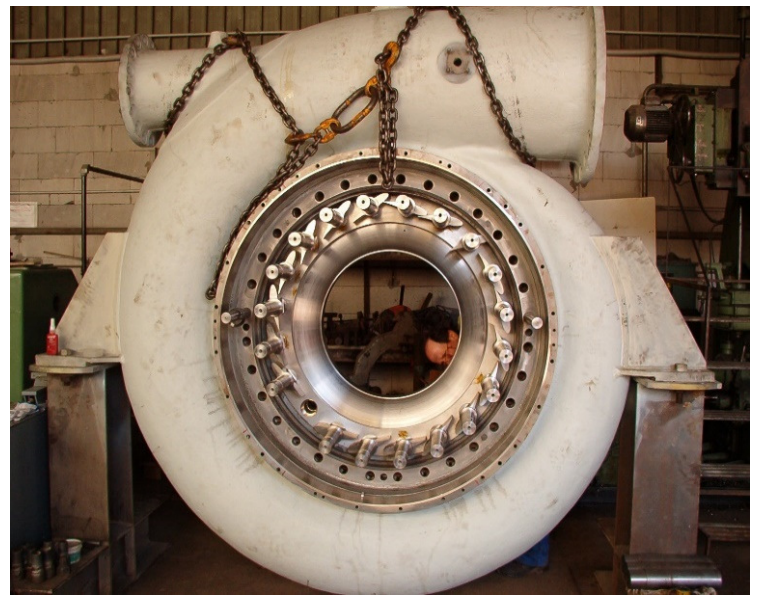
Distributor cover - Francis turbine



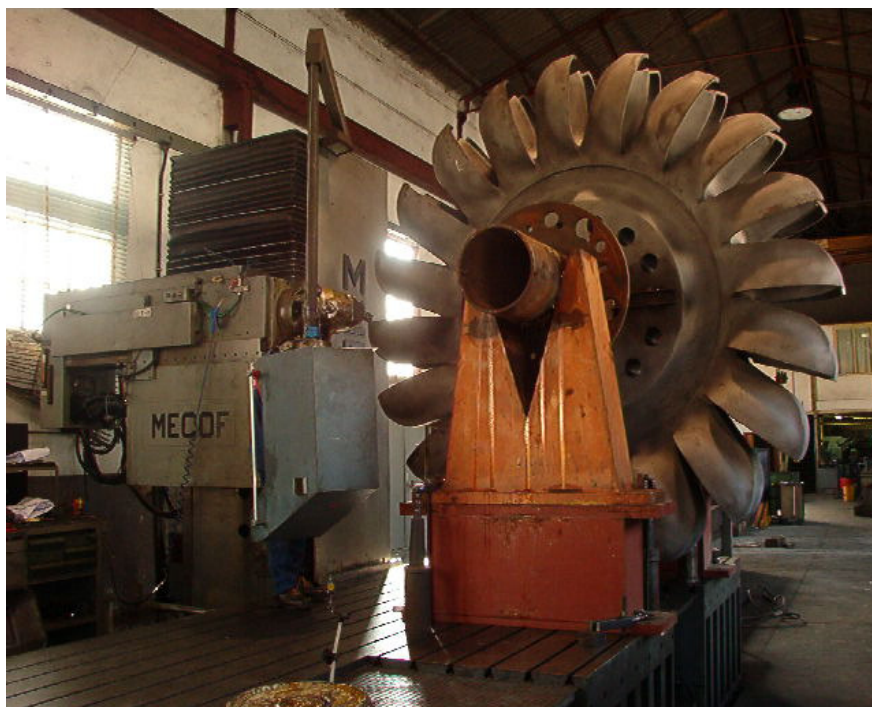
Rotary valve body



Francis Impeller



Francis turbine distributor



Pelton Impeller



Turning process of rotary valve casing



Half casing of rotary valve