



Implementation of a Gas Plant Updating its Electrical System

The need to expansion and modernization of the electrical capacity and power supply of the plants of a strategic gas power plant in Egypt has placed the end user in the condition not only to physically add a new electric station, but also to redefine the whole study of electrical engineering and loads of all the electrical stations present in the plant. Costruzioni Elettrotecniche Cear Srl, having worked in the past on the same site, was called to redefine the new electrical engineering study and its supply for the improvement of the electrical power plant.

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Fig. 1 – The Power Motor Control Center

During the last years the oil&gas sector has turned to new plant management approach based on increasingly frequent redevelopment of sites, an improvement and optimization of extraction process, growing up efforts in the exploration and research of new buckets from which to draw the raw material (subsea and shale gas). Thanks to these new investments, both revamping and exploration, the map of potential and effective development areas was redefined; in this territory, that includes some places located in the Mediterranean area, it was decided to invest resources and consequently studies for the expansion of LNG (Liquified Natural Gas) plants.

In the last ten-year period, particular attention by the oil companies, has been focused on the Egyptian coasts, where we remember the recent discovery of gas field realized by Eni in 2015, the now famous site called

“Zohr”. In fact, not only “Zohr” site, but also other deposits already active on the Mediterranean coast, are object of the attention of Governments that, based on specific investment plans, are focused resources and energy on expanding and improving the sites for the management and production of the plants.

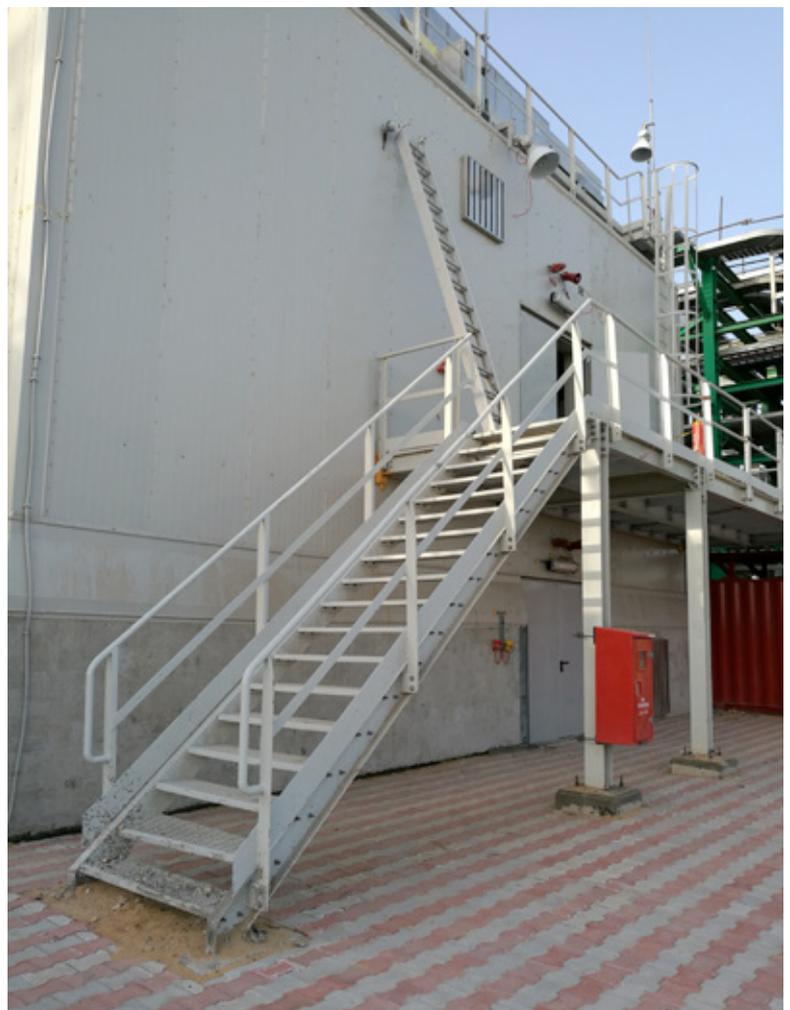
Finding the proper Electrical Engineering Solution

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According to the evaluated LNG plant new electrical power requirement for the project and after some site survey, Cear in cooperation with the technical department of the Engineering Company, they defined

Fig. 2 – A view of Electrical Power Module Building



the modification/updating to be performed on the existing electrical power plant.

Cear has carried out a document defining the electrical Power System Operating Criteria for the area located in the existing plant section and in the new plant section. The scope of this document was to describe the power system operating criterion and the different scenarios in which the electrical system may operate. In particular, the document described the overall power system configuration, with the representation of the operation criteria of generation, existing 6.6 kV Medium Voltage switchgear, existing Low Voltage switchgear and new Low Voltage switchgear.

Aim of the new electrical study was also to re-define and translate in a workstation's software the control and monitoring of the extended electrical power plant. In addition to that, the customer required to have the whole power study calculation, to check the protective relays setting value in order to assure protection to the users and obtain selectivity in case of faults into the electrical network.

Basically, the protective philosophy was based upon the knowledge that the faults or abnormal operating conditions can be lead to:

- overloads;
- ground faults;
- phase to phase and three phase faults.

The study was conducted with the following power

system study detailed as:

- short-circuit current calculation;
- load flow calculation;
- motor starting analysis.

The improvement of the Power Plant

Consequently, according to the electrical studies, Cear has developed a new "Overall Single Line Diagram" that was representing an update of the present power plant extended with an additional electrical station for the new plant.

As per updated Overall Single Line Diagram, Electrical system configuration included some modification on the electrical equipments installed in the existing electrical substations; existing 6.6 kV Medium Voltage switchgear needed to be updated and modified to connect the relevant outgoing circuit breakers as follow:

- Two *existing* outgoing CB (Circuit Breaker) connected to the existing two 1.6 Mva step down (6.9 / 0.38 kV) transformers for feeding the 0.38 kV LV (Low Voltage) switchgear of the existing substation;
- Two *existing* outgoing CB connected to the new two 2.5 Mva step down (6.9 / 0.4 kV) transformers for feeding the 0.38 kV LV switchgear of the new plant;
- Two *new* outgoing CB (obtained adapting the existing independent 6.6 kV cb) connected to the new two 2 Mva step down (6.9 / 0.38 kV) transformers for feeding the existing 0.4 kV LV power center in case of loss of power generation in its substation;
- One *new* outgoing CB (added) connected to a new flashed gas compressor main motor.

The improvement of the plant required also some new electrical equipment as:

- Two *new* gas generators each of rating 2.5 MW to feed existing 6.6 kV switchgear in existing substation;
- One *new* diesel generator 1.6 Mva connected to the new 0.38 kV LV switchgear to be used either as emergency or as stand-by generator.

In addition to that, was foreseeing also a *new Electrical Power Module Building* based on a modular metallic structure covered by insulated panels designed and supplied by Cear including all technological facilities required by the environmental condition as:

- HVAC (Heating, Ventilation, and Air Conditioning) system;
- Pressurization system;

Fig. 3 – The Medium Voltage Switchgear



- F&G (Fire & Gas) detection and extinguishing system;
- Internal and external lighting;
- Power socket system;
- Voice and telecommunication system;
- Grounding system;
- Lightning system.

Inside the building were located all electrical equipments that Cear as designed and manufactured as per project requirement:

- the *Engineering Workstation*, hosting SCADA and PMS System monitoring the overall electrical power plant;
- the *Interposing Relay Panels*, to manage the control and status signals between DCS (Distributed Control System) and the 0.38 kV LV switchgear;
- the *Auxiliary Service Panel*, for 220 Vac auxiliary service circuits (space heaters and internal lighting of the electrical panels);
- the 110 Vdc *Dual Redundant Battery Charger*;
- the *load shedding panel*, to manage the outgoing load shedding of 0,38 kV LV switchgears (new ATOLL switchgear and the existing 0.38 kV WHX LV switchgear);
- *two new 4000 A Low Voltage Bus Ducts* to connect the new 0.38 kV LV switchgear Incomers to the new 2500 kVA power transformer;
- *a new 0.38 kV Power Motor Control Center*, intelligent type, that had to manage the new field equipment (pumps, valves, compressor etc.) required by the additional gas production power plant.

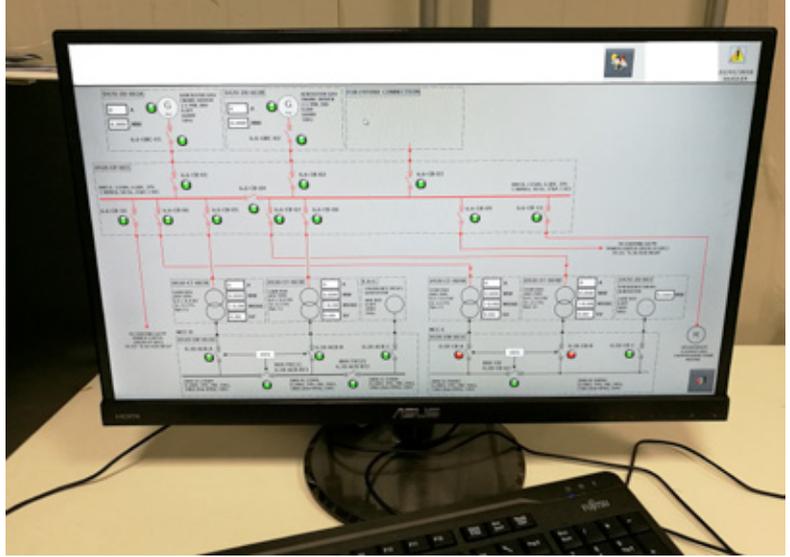


Fig. 4 - The Plant Workstation

Conclusion

All the modification and new installations have been delivered according to a specific planning and were installed locally with the supervision of Cear's specialized technicians that worked with local workforces to complete the project on time.

Cear has respected delivery time required by the customer and within eleven months has completed the job, putting the customer in condition to make the start-up of the new gas plant.

This ambitious target have been reached by Cear, with a proper co-ordination of miscellaneous engineering disciplines (mechanical, electrical and instrumental) that put the Company in condition to have a complete know-how and commitment towards the Customer and its needs, taking care of it from engineering to on site installation and completion of activities.



Alessandra Ranno

Alessandra studied Languages and Communication, then graduated in Marketing and Communication at the University of Milan. She's in Cear Srl since 2010 and

she's in charge as Sales and Marketing Manager for coordinating marketing activities, sales team and implement international markets.