



*Fig. 1 - Modules
Fabrication*

Modularization affecting the Oil and Gas industry

The Italian Company APS SpA executed a Modular Plant Project for a licensed plant in Tarasovskoe field, the Russian Federation. The role of efficiency was fundamental in this successful project

Martina Marmotta, Zivile Kriaciunaite, Massimo Paris
APS S.p.A.



Sviluppo Economico – MISE” dated January 20, 2015, in order to be entitled and allowed to export to Russian Federation the equipment inherent the Project.

In April 2017, APS has met once again all expectations bringing thus to fulfillment its mission. Modules, equipment and machinery have been modularized at the maximum possible level in order to save time and to reduce field labour during assemblage and installation in the construction area.

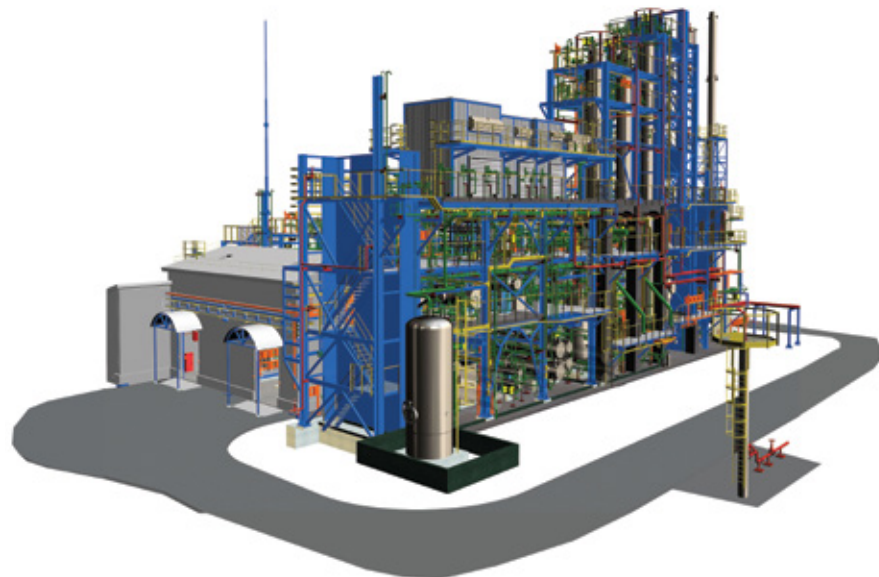
The Modules left the manufacturer’s factory nearly complete and certified TR CU (Technical Regulation Custom Union), with most of its support structure, pipe, instrument stands, electrical wiring, grating, insulation and other components built-in and ready for operation, once connection is made to the plant’s systems. The modules were transported to their final assembly site into easily portable skids.

The main factors that contributed to the success of this project have been the APS local presence in the Russian Federation with its Representative Office in Moscow, and the technical support of the State Unitary Enterprise GUP INKHP RB, for the examination of project and working documentation, including its conformity to the requirements of the Russian Federation standards. These local partners allowed APS to overcome a number of objective difficulties related to geographical distance, different institutional standards and language.

Fig. 2 –3D Modeling Project

In the last few years APS SpA, the Italian Engineering and Design Global Contractor, signed a contract with a Company, which operates as a subsidiary of ROSNEFT Oil Company, for designing, production and supply of diesel hydrotreating block-module unit. Project investment was part of the Client’s business targets to satisfy market needs for petroleum products through the development of advanced technologies with a special attention given to increase operational efficiency and modernization, in compliance with Russian Regulations. Tarasovskoye field (Yamal-Nenets Autonomous Region, the Russian Federation) was chosen as the location of the unit plant and considering also the harsh ambient conditions, the plant needed to be designed as a block modular supply to reduce drastically the installation complexity and time.

The decision of the Client to rely on APS was motivated by the Company’s functional and technical skills in this sector, as well as the flexibility and the high expertise in Lump Sum Turn Key plants design and building. In order to perform the Contract, since APS operates in compliance with the regulations and laws, including those which govern the import and export operations, APS has obtained the mandatory Authorization from the Italian Public Authority named “Ministero dello



Project highlights

The Diesel Hydrotreating Unit, based on American License, has a capacity of 15 m³ / h (2264 barrels / day); its aim is to reduce the amount of sulfur present in the gasoil within the limits defined by the Russian Technical Regulation approved on 27 February 2008. Placement of this modularized plant is planned at the

territory of the refining Complex in the District of Yamal-Nenets Autonomous Region, for this reason, the Licensor obtained permission from the U.S. Department of Commerce to export its own materials to the Russian Federation.

APS team designed 8 (eight) modules of a dimension compatible with railway and truck transportation. All modules have been totally prefabricated, in collaboration with Gruppo Antonini.

Of particular importance for its complexity and dimensions are:

Module 8 (13900x6300x6250 mm): The make-up hydrogen compressor unit is intended for maintaining permanent hydrogen concentration and circulation in the reactor unit, as in the process of the diesel fuel hydrotreatment a part of hydrogen undergoes various reactions and is removed together with hydrocarbon gases. All unit components are connected with each other by the pipes. The Hydrogen from module 8 will be mixed with gasoil coming from the Atmospheric distillation unit and feeding to reactors system. (figures 3-4)

Module 2 (6050x6000x4800 mm): The reactor recycle pump module is used to provide the recirculation of diesel coming from the reactors and include two canned vertical pumps (licensed equipment) with two reciprocating pumps (licensed equipment) with maintenance sites and piping system components. The lubrication system of recycle pump is provided by the Module 7 (3750x2000x5141 mm) through the gasoil produced by DHU itself. (figures 5-6)

The design stage has great significance for the Modular construction process. The use of advanced 3D Modelling software is among the main factors contributing to an accurate review of accessibility for maintenance, operation and safety. Moreover, it is necessary to include design allowance in order to avoid any misalignment of components during the assembly. Once modelling is sufficiently progressed, the software allows a “walk-through review” of the modules simulating exactly the future configuration of the plant. The 3D modelling, (figure 2) skillfully used by APS Team, has allowed to solve, in design phase, any type of clash or physical inconsistencies thus avoiding costly and time consuming modifications during construction phase.

Modular plant solution

The economics of the downstream industries are under pressure due to the low cost of oil and natural gas and uncertainties regarding their future as the world economic situation is changing rapidly. Major capital projects are being re-evaluated in a market where supply, demand and pricing have suddenly become uncertain. In addition, developing countries are quickly building new plants and infrastructure to support a rapidly growing middle class that demands all the benefits of modern industrial production.

Modular construction is widely used in many fields and approaching this solution could help also the EPC sector to use it as a standard successful approach that can generate a lot of benefits. This highly efficient process may be a solution for projects located in remote regions where skilled labor is difficult to secure. It gives the possibility to reduce schedule and cost uncertainty and may help achieve a faster start-up (figure 7).

Modularization has become particularly prominent in the offshore oil and gas industry [1]. By fabricating key components in a controlled environment, it is possible to minimize risk, improve quality and increase overall safety. Units derived from fabrication workshops can be preassembled for shipping anywhere around the world and modular construction can be more easily executed with available on-site skills [2].

Nevertheless, there is still low awareness level of both

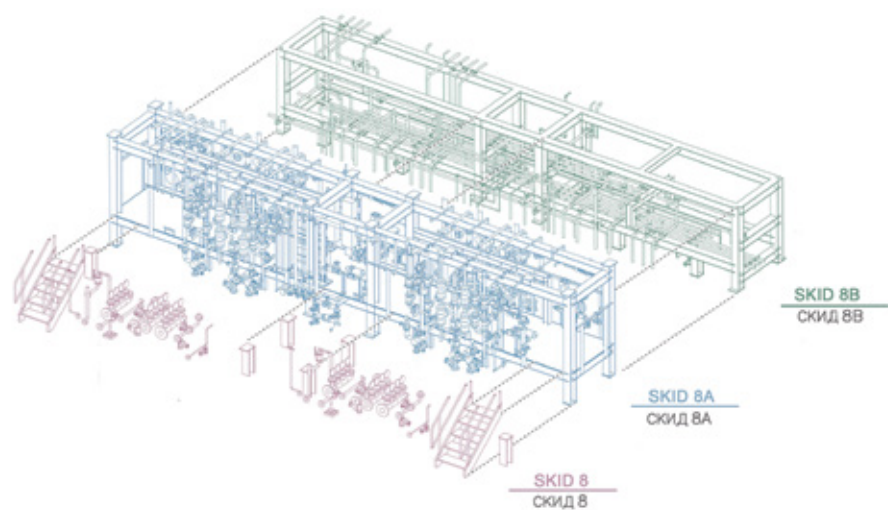


Fig. 3 – Assembly of Module 8



Fig.4 – Module 8

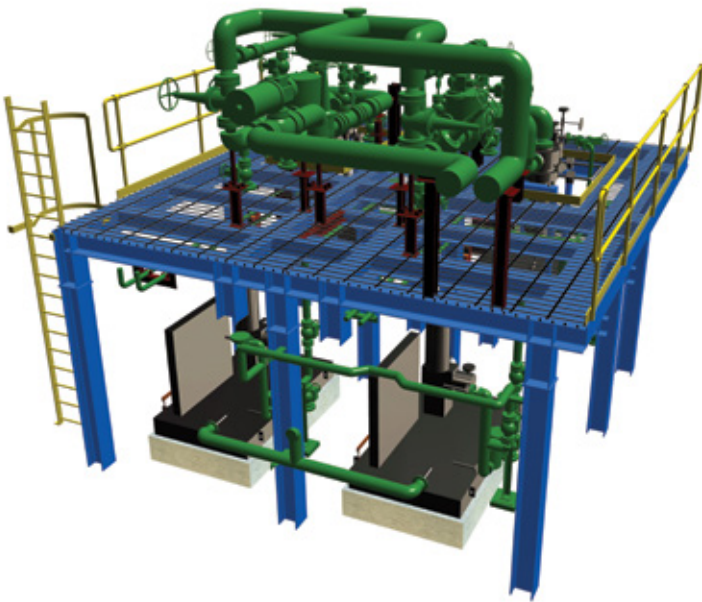


Fig. 5 –Module 2 Model



Fig. 6 – Module 2

EPC contractors and Clients on the results of modularization and this technique is quite recent in the Oil and Gas sector. However, the number of modular projects is increasing and more and more companies are interested in better understanding the potential of the modular execution mode [3].

Modular construction does not come without drawbacks.

One of the biggest challenges associated with prefabricating modules offsite is transportation.

of the modular project of APS, now nearing completion: *“Prefabricating modules is an increasingly popular strategy in today’s competitive construction and upgrade market, which transformed the approach to building process systems and plants”.*

He goes on to say:

“With regard to my project, APS prefabrication strategy has started with a thorough skills assessment. Certainly, transportation constraint was one of the biggest challenges. The systems had to be designed into

MODULAR CONSTRUCTION



SITE-BUILT CONSTRUCTION



Fig. 7 – Typical scheme “Modular VS Site-built Construction”

Modules typically consist of multiple pieces of equipment ancillary piping, control systems and other components on a single skid, for this reason size and weight can be significant.

Shipping logistics and transportation form integral parts of modularization design and are influenced by the geographical location of the facility, the type of modularization, and the location of the module fabrication yard.

This issue is also highlighted by the personal experience of the Project Manager, Mr. Massimo Paris, responsible

portable skids in order to match the predefined cargo dimension of 12000x2700x2600 mm. In only a few months we succeeded in delivering by railway and truck the modules to site. It was an exciting experience and today’s results show that APS has great potential”.

Looking at the Russian market

Oil and gas are the primary assets of Russia in terms of the government revenue they generate and the stable economic growth and social development that the

industry support. Russia's economy in fact is highly dependent on its hydrocarbons, and oil and natural gas revenues account for more than 40% of the federal budget revenues. Most of Russia's oil and gas resources are located in West Siberia, and in the Urals-Volga region, extending into the Caspian Sea, so Russia's eastern fields may play a larger role [4]. As a consequence, in the coming years, a number of Russian oil and gas Companies could announce plans for significant investments.

APS is well positioned in the Russian territory where it already has long-term presence and, in order to remain competitive in the eastern market, it also obtained the engineering license of SRO NP "Neftegaseservices", applicable throughout the entire territory of the Russian Federation.

Company management sometimes means diversifying with the aim to improve efficiency. The usage of Modular as well as on-site Construction enables APS to be flexible and to have a complete kit of engineering

solutions in order to manage successfully Oil and Gas Market demands and complexity and to make projects easier for the Customers, regardless of the project size, scope or location.

Sources:

[1] Source: <http://insights.globalspec.com/article/3002/modular-construction-in-the-oil-and-gas-industry>

[2] Source: <http://www.hydrocarbonprocessing.com/magazine/2016>

[3] Source: "Supporting Decisions on Industrial Plant Modularization: A Case Study Approach in the Oil and Gas Sector" *Proceedings of the 2016 International Conference on Industrial Engineering and Operations Management Kuala Lumpur, Malaysia, March 8-10, 2016*"

[4] Source: <https://www.eia.gov/beta/international/analysis>



Martina Marmotta

Martina Marmotta is graduated degree in International Relations. Since 2013 she is registered in the Register of Italian National Journalist with her experience of

reporting and writing on national newspapers. In APS she deals with quality system implementation, as well as support to the Commercial Business Unit.



Zivile Kriauciunaite

Zivile Kriauciunaite received a Master degree in People Strategy and after she specialized in Digital Marketing and Communication. She worked on several International projects, funded by European Union, as

responsible for the development of communication strategies. In 2015, she joined APS where she works as Marketing Specialist and is responsible for promoting the Company's brand and services.



Massimo Paris

Massimo Paris is graduated degree in Managerial Engineering. In APS he has covered various positions like Instrument Engineer, Cost Control Engineer, Site

Manager and Project Engineer. Currently is managing the Modular project for the construction of the Diesel Hydrotreating Unit.