



Fan Ambient Air Vaporization (FAV)



Glycol-Water Shell and Tube Vaporization (STV)



Innovative Water-Bath Vaporization (WBV)

Standardized, Scalable LNG Import Terminal

AG&P has developed three standardized technologies for regasification modules for its LNG import terminals that meet the needs of a wide range of customers. The LNG import terminal is scalable and modular, allowing it to grow in line with demand, while achieving a significantly faster schedule and more cost-effective facility.

Application of the technologies provides options for customers in emerging markets who are currently unable to access gas. Project owners can choose the initial infrastructure they need according to the site-specific requirements for each project for efficient capital deployment. The design ensures utilization rates are high from terminal start-up and enables relocation of the regasification modules to new demand centers as required. This optimizes cash flow, facilitating faster decision-making.

Standardized Design

A key component of AG&P's innovative LNG import terminal design is a standardized 125MMSCFD LNG regasification module that utilizes fan ambient air vaporization (FAV), glycol-water shell and tube vaporization (STV), or innovative water-bath vaporization (WBV) technologies allowing it to be used onshore or offshore. The standardized and flexible approach not only reduces project cost and schedule, but because it is easily scalable, it meets the needs of small-scale to large-scale projects offering different delivery pressure ranges based on the requirements of each facility.

AG&P provides a complete EPC package with minimum design service life of 25 years with regular inspection and maintenance. The regasification module designs consider the Best Available Techniques (BAT) and Best Environmental Practices (BEP), and are based on applicable codes, standards and considerations for:

- Capacity and performance
- Maintenance and operability
- Safety
- Footprint area
- Acceptable emission limits



Standard Regasification Module

ITEM	DETAILS
Total regasification train capacity	Nominal 125MMSCFD per train [scalable]
Regasification system turndown capacity	25MMSCFD
LNG suction drum volume	1 x 250 m ³
LP LNG pumps	[N + 1]* 250 m ³ /h each
HP LNG pumps	[N + 1]* 250 m ³ /h each
Power supply	Site specific
Regasification technology	WBV, glycol-water STV, or FAV
Delivery pressure	Flexible [class 300 or 600]
Application	Onshore, offshore

* does not apply to WBV

Comparative Benefits

COMPARISON FACTOR	FAV	STV	WBV
Heating medium	Air	Glycol-water/seawater	Hot water-bath
Regasification technology	Direct vaporization with air	Indirect vaporization with glycol-water as intermediate fluid heated with seawater	Indirect vaporization with water-bath heated with submerged combustion fire tube and waste heat economizer
Nominal capacity [standard module]	125MMSCFD	125MMSCFD	125MMSCFD
Vaporizer required utilities	Electrical power	Electrical power, glycol-water, seawater	Electrical power, fuel gas
Single train module envelope [L x B x H]	146' x 46' x 53'	54' x 37' x 35'	68' x 70' x 43'
Advantages	<ul style="list-style-type: none"> • Provide full vaporization duty with no supplemental heating in warmer climates [~20°C and above] • Simple operation and maintenance • Ability to recover chilled water; no seawater required; minimum air emissions 	<ul style="list-style-type: none"> • Provide vaporization duty with use of "available" heat from seawater • Minimum air emissions 	<ul style="list-style-type: none"> • Smaller footprint when plot space is limited • Optimize energy usage with waste heat recovery • No seawater required • Ultra-low NOX burners
Emissions/effluents	Potential fog	Potential cold seawater and chloride residue	Stack gas [NO ₂ and CO ₂] and acid water condensate

LNG Import Terminal Systems

LNG Unloading and Transfer System:

- Marine Unloading Arms (MUA) used to transfer LNG from the FSU to the onshore regas facility
- One liquid, one vapor and one hybrid arm are included in the design

LNG Vaporization System:

- Open or closed loop glycol-water STV, FAV or WBV vaporizers
- LNG suction drum
- LP LNG pumps [optional]
- BOG recondenser [optional]
- HP LNG pump suction drum [optional]
- HP LNG pumps

BOG Handling System:

- Cryogenic BOG compressor [with BOG compressor suction drum, if required]
- BOG recondenser with sufficient capacity to handle low BOG flow rates during normal operations and higher flow rates during LNGC unloading operations [optional]
- BOG recondenser is designed to recondense a maximum of 12MMSCFD of vapor at the maximum regas send out rate of 125MMSCFD [optional]
- HP BOG compressor designed to compress excess BOG to send out pressure [optional]

Sampling and Custody Transfer Metering Station:

- Z-configuration skid [2 x 100%] with a fiscal quality AGA9 compliant ultrasonic flowmeter with flow conditioners
- One online gas chromatograph and associated HMI computer equipped with a SCADA-type software for process control and gathering of real-time data
- Separate LNG sampling system at the LNG manifold from LNGC for LNG BTU calculations [optional]

Optional Truck Loading Facility:

- LNG for the truck loading facility supplied from the LP LNG discharge manifold
- Vapor from the truck loading facility sent to the common LP vapor manifold
- Details for the truck loading bays, LNG pump skids, pipe and hose gantries, weigh bridges [scales], connections, controls, security to be provided by the supplier of the truck loading packages

Summary

When planning any LNG project, one of the toughest challenges is ensuring the import terminal will be able to meet both current and future demand while phasing the project's total investment. By integrating a standardized, scalable regasification module with floating storage, AG&P's LNG terminal configuration significantly improves the schedule and mitigates traditional bottlenecks, such as large onshore conventional storage tanks and other major civil works. The use of a hybrid, flexible approach is AG&P's preferred solution because:

- Capital cost is reduced and efficiently utilized through phased development
- Infrastructure is right-sized to match current demand, increasing efficiencies and eliminating unwanted surplus while pre-investing in key components that will support future demand
- The modular approach means assets can be built quickly so a project is operational faster, delivering earlier returns to investors

For more information, visit www.agp.ph

Published November 2018
