AG&P

Infrastructure Reimagined and Delivered

LNG to Power
Why Asia is leading the small-scale LNG revolution

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Who is AG&P?

- Based in the Philippines, AG&P is a global leader in delivering cutting-edge modularized products and support services to vessels, projects and plants in the energy, natural resources and industrial sectors worldwide

- 117-year heritage as a pioneer in industrial modularization and rapidly becoming a leader in small-scale LNG

LNG

Modularization

Onsite Construction

LNG landscape in Southeast Asia

Challenges

Demand

- Small and stranded demand centers
- Inconsistent supply
- Customers reluctant to switch fuel source
- Limited access to end-consumer

Infrastructure

- Poor regional pipeline network
- No medium or small receiving terminals
- No current logistics solutions
- No medium or small storage centers
- No break-bulk locations in in the region

Geography

- Isolated demand centers
- Small demand points expensive to serve

Mid-stream and downstream LNG solutions

Opportunities

Demand

- Several markets have plans to develop gas IPPs
- Regional power players fueling gas growth
- Captive power users switching to gas-fired plants
- Industrial retail growth

Infrastructure

- Existing large regasification facilities can be easily retrofitted for break-bulk facilities
- Regional opportunities for building mini-hubs
- Maritime bunker shuttle developments for delivery to industrial customers

Geography

- Maritime solutions offering maximum flexibility will drive uptake across the region
- “Break-bulk” modularized asset developments is the solution for the region

AG&P's point of view

- Demand centers in the region are growing – especially small and mid-scale
- Innovation and technology advancements have lowered costs and opened up new demand
- Emergence of small and medium-scale value chains
- Standardized technology and modularization create an opportunities for "plug and play" solutions
- Increasing openness by market participants to jointly take part in project development

- Standardization and modular equipment will provide turn-key solutions for customers and boost future demand for LNG

Case study: Bali 50 mmscfd LNG FRU

- GAS Entec delivered the world's first small-scale floating regasification unit in March 2016
- Installed in Benoa Port, Bali this FRU powers Bali, Indonesia

  - Client: JSK Shipping (Indonesia)
  - Scope of Work: EPC contractor
  - Shipyard: KangNam Corporation
  - Timeline: 2015 – 2016
  - Classification: KR

Dimensions of vessel/barge	Regasification system
LOA: 46.0 m Breadth: 12.0 m Depth: 4.7 / 5.2 m LNG buffer tank: • QTY x capacity: 1 x 400 m^3 • LNG feed pump: 2 x 100 m^3 / hr x 260 mlc, electric motor-driven, barrel type	LNG flow to skid: 50 mm scfd Inlet / outlet temperature: 158ºC / min. 5ºC NG outlet pressure: 900 kPa.g

AG&P’s plug-and-play solution: small- and mid-scale LNGC

Floating ship-to-shore LNG off-loading solution

Regasification

Liquefaction

Design and supply of cargo handling and automation systems

Engine and controls design and supply

Cargo tank design using MKIII membrane

Hull design

BoG management

Thruster design & equipment supply

AG&P delivers design, procurement, fabrication, financing, operation and maintenance

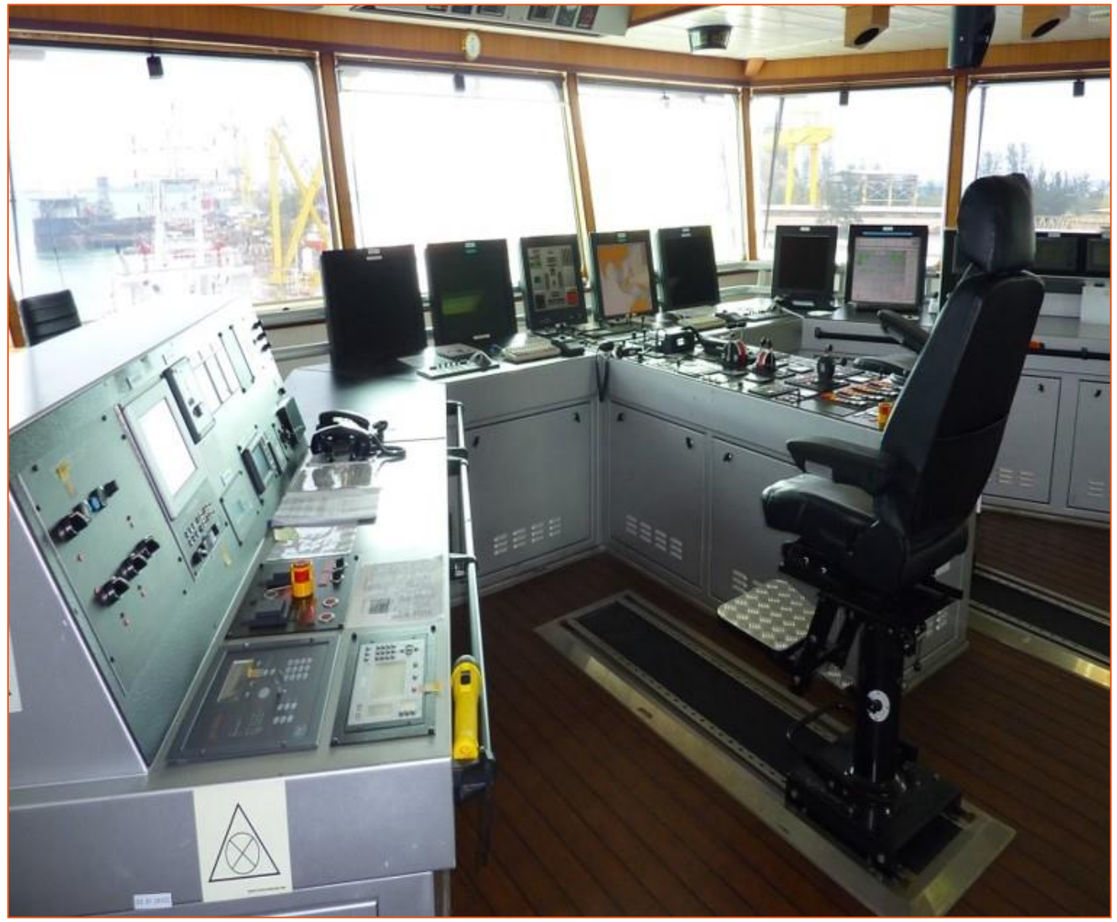
Ultra-shallow LNGC: designed for Southeast Asia

4000m^3 with thruster

4000m^3 with propeller

Vessel design concept: propulsion and controls

Forward Bridge Control

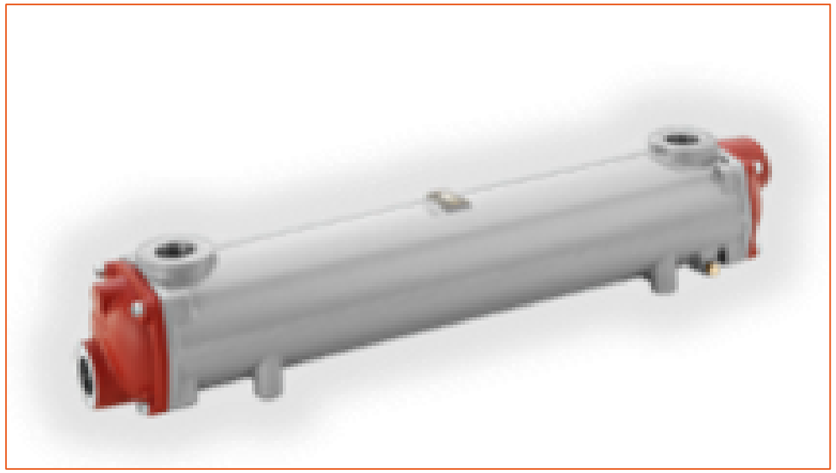


Rear Facing Bridge Control

Proposed cargo containment system (CCS)

- Cargo containment system (CCS) is provided by GTT MKIII membrane
- BOG 0.45V%/d : 347kg/hr
- Single tank with chamfered corners can with stand sloshing loads up to Beaufort Sea State 4/5 with out reinforced foam
- Single tank reduces installed equipment costs
- Can discharge LNG into type C tanks

Cargo handling system by Gas Entec



- BOG handling has a simple configuration
- 2 liquid lines and single vapor return
- LNG Cargo pumps rated at 600m/hr.
- CCS cooled down using spray pump
- CAMS system fitted

Alternative cargo handling system

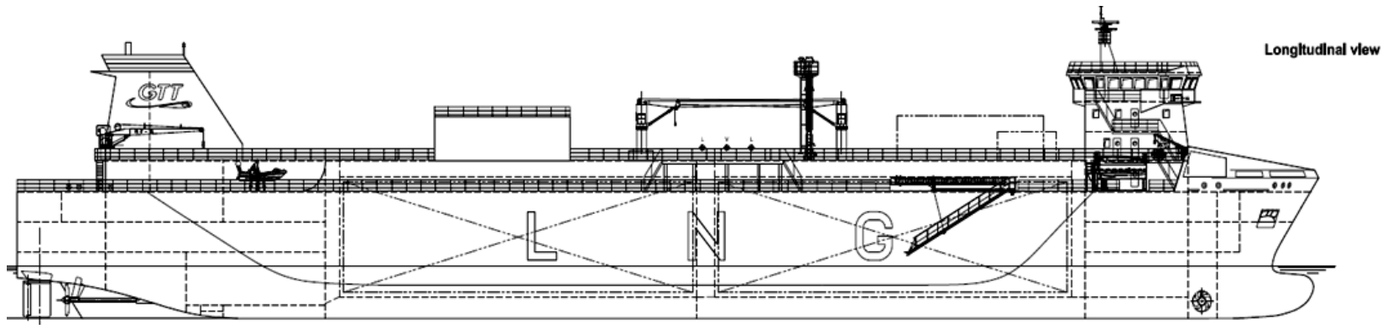
Standardized and referenced Turbo Brayton™ reliquefication unit 0.2 to 2 tph BOG Air Liquide

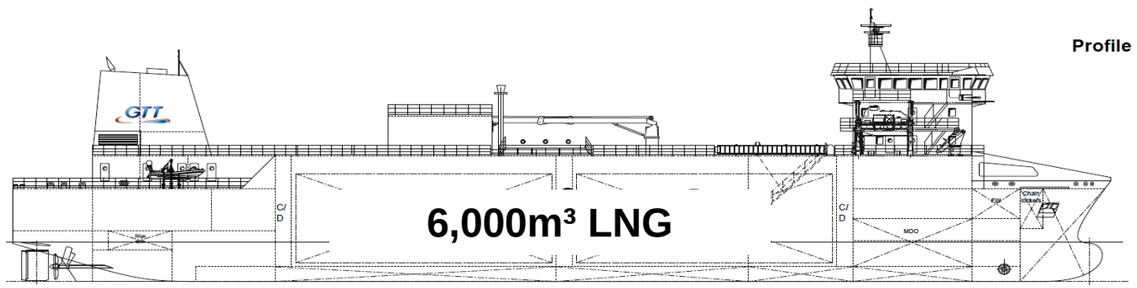
AG&P's standardized LNG delivery platforms

- Selection of shallow draft barge design and conventional vessel hull design allows for fixed-cost hull construction over a scalable range, typically:
    - Platform 1: 4,000 to 8,000m³ capacity for shallow-water delivery
    - Platform 2: 6,000 to 16,500m³ for open-water delivery

- Incorporating identical equipment packages onto scalable but different hull platforms significantly:
    - Reduces costs
    - Reduces schedule
    - Ensures quality and safety

Scalable capacity range





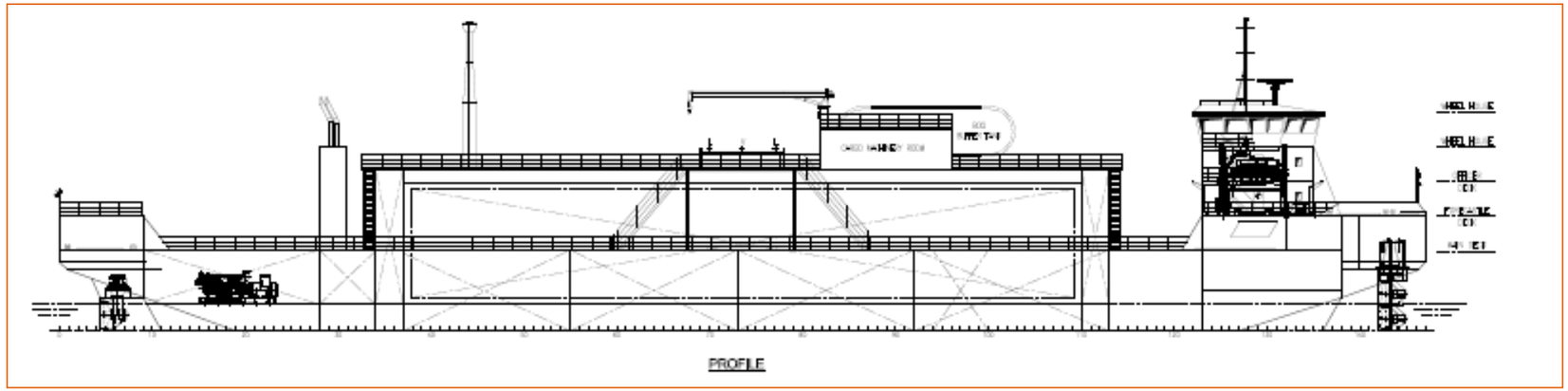
16,500m³ vessel

6,000m³ vessel

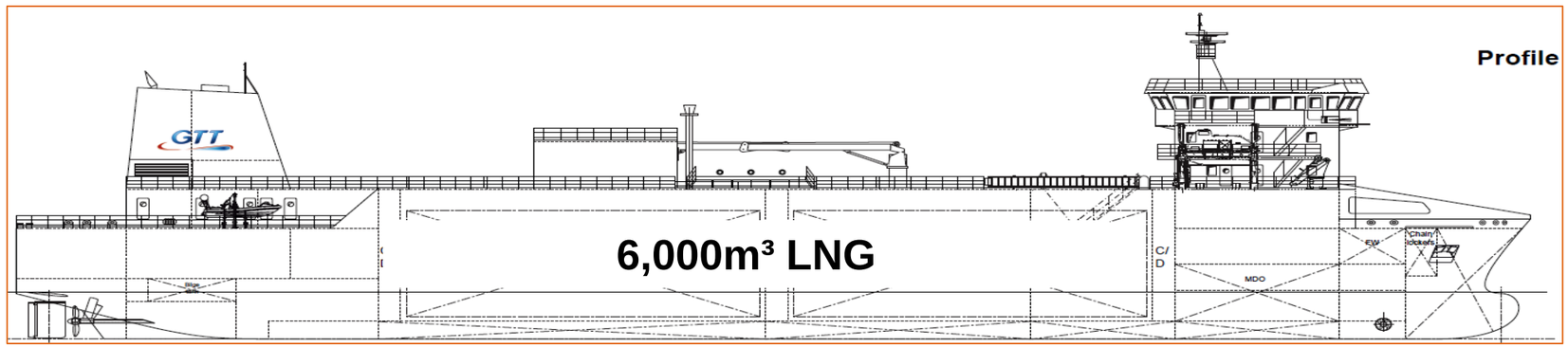
- Utilizes identical hull design and equipment from 6,000, 7500,10,000 up to 16,500m³

Standardized design components

- Barge and conventional hull design are deliberately configured to use identical layout which allows identical equipment fitment



Ultra-shallow draft barge



Conventional hull

Standardization and integration drive efficiencies and uptake

- AG&P has focused on optimizing the storage and marine design to drive cost-efficiencies and adoption
- Our products utilize existing GTT hull designs specifically configured to optimize membrane tank configuration
- Geometrical membrane tanks are standardized which reduces re-engineering costs
- Detailed designs are completed by AGP/GET using integrated solution partners in low-cost geographies
- All equipment including accommodation fitments and bridge equipment are standardized packages

Conclusion

Standardization and modular equipment will provide turn-key solutions for customers and bolster the future demand for LNG

- **Shorter delivery schedule** - no lead times on engineering
- **Lower cost** – standardized equipment and technologies integrated into AG&P's product designs cuts the cost of customized engineering. All procurement, fabrication and testing is carried out in our cost-optimized facilities in the Philippines
- **Higher quality and safety** - standardized products allow for high-quality work due to repeatability and experienced installation

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