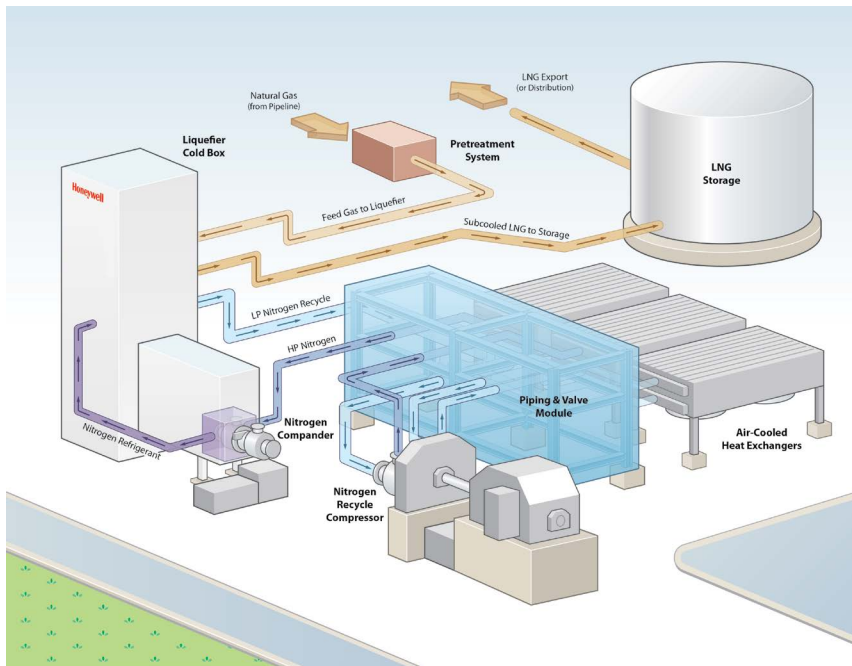


SMALL-SCALE LNG LIQUEFACTION PLANT CAPABILITIES FOR CAPACITY UP TO 800 TPD*

Simple design, competitive cost and schedule



A peak shaving facility featuring the AP-N™ LNG Process, fully equipped with each core system integral to safe and reliable liquefaction.

UNRIVALED EXPERIENCE

Honeywell LNG's small-scale LNG offerings provide cost effective and reliable solutions for owners and project developers. Backed by over 50 years of experience in LNG engineering and process design, Honeywell LNG's unrivaled technology is proven to perform.

Honeywell LNG together with Honeywell UOP's pretreatment, and Honeywell Process Systems (HPS) controls and automation, offer a broad set of solutions for your LNG project.

HONEYWELL SMALL-SCALE LNG OFFERINGS INCLUDE:

- AP-200T™ Product - 200 TPD AP-N™ LNG Process
- AP-400T™ Product - 400 TPD AP-N LNG Process
- Customized capacity from AP-C1™ and AP-N LNG Processes
- AP-SMR™ LNG Process or multiple trains of AP-N LNG Process for higher capacity



Honeywell LNG cold boxes installed at a plant site in Hokkaido, Japan (courtesy of JAPEX).

SMALL LNG PLANT APPLICATIONS

- Peakshaving and emergency reserve
- Mining and transportation fuel
- Remote gas monetization and virtual pipeline
- Bio LNG
- Shipboard and LNG terminal BOG reliquefaction

*metric tonne per day

Honeywell

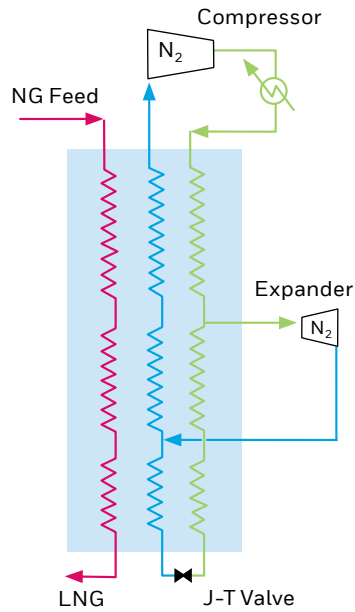
PROVEN DESIGN

Honeywell LNG's efficient process designs have proven to be robust and reliable in natural gas liquefaction service. Small-scale liquefaction plants built decades ago, using this equipment, remain in service today.

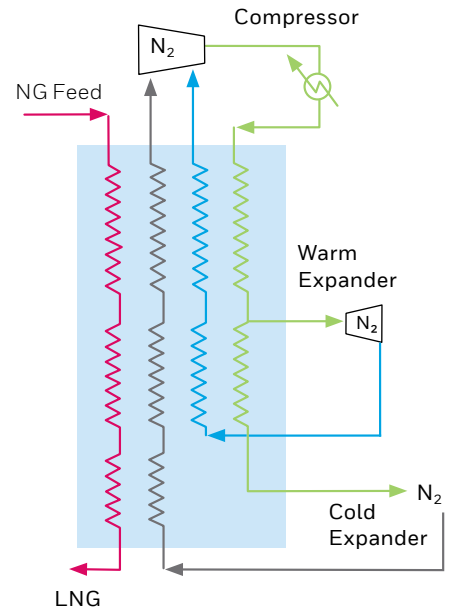
VARIOUS PROCESS CONFIGURATIONS AVAILABLE TO SUIT YOUR REQUIREMENTS

AP-N Nitrogen recycle

This process is available in two options: single-expander or dual-expander.



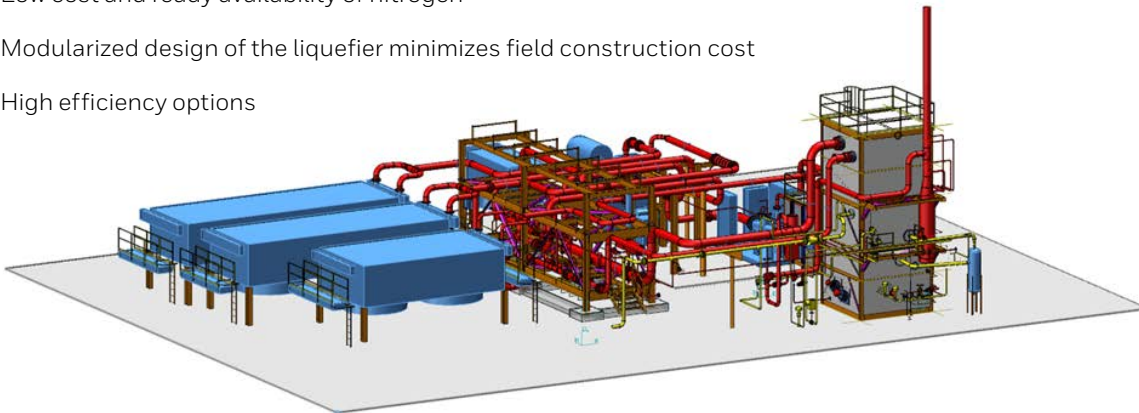
Single-expander AP-N Process offers standard designs, low capital cost and proven technology.



Dual-expander AP-N Process offers standard designs, multiple expanders allow for higher efficiency.

FEATURES AND BENEFITS OF NITROGEN EXPANDER CYCLES

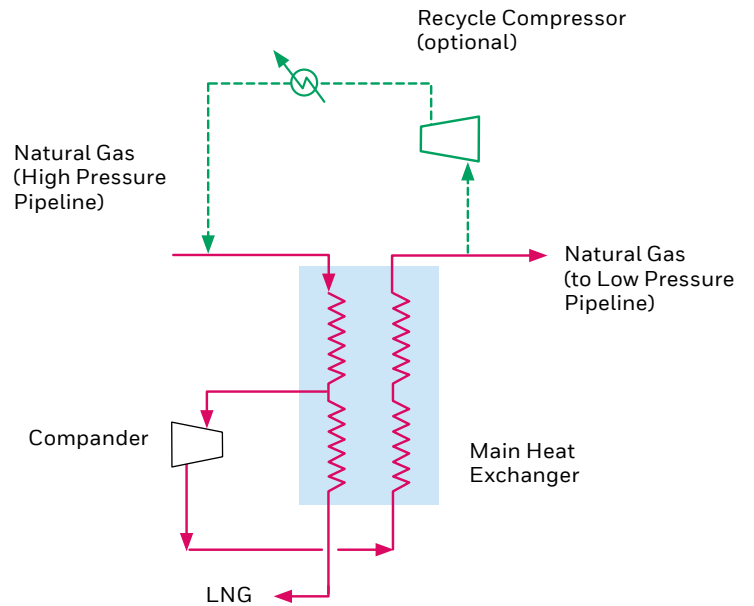
- Lower capital cost than competing mixed refrigerant technologies
- Simple operation and superior turndown efficiency
- Nonflammable and environmentally benign nitrogen refrigerant
- Low cost and ready availability of nitrogen
- Modularized design of the liquefier minimizes field construction cost
- High efficiency options



3D drawing for peak shaving, BOG reliquefaction, and other small capacity applications.

AP-C1™ LNG Process (methane expansion)

The AP-C1 process uses the feed gas as the refrigerant eliminating the need for external refrigerants and reducing the costs associated with refrigerant import and storage. The technology is proven and can convert natural gas feed directly to LNG by taking advantage of the pressure differential between two pipelines, thereby eliminating incremental power input as well as a refrigeration compressor. An optional methane recycle compressor would provide increased process flexibility and availability.



COMPARISON OF SMALL-SCALE LNG LIQUEFACTION PROCESS OPTIONS			
	SINGLE-EXPANDER AP-N	DUAL-EXPANDER AP-N	AP-C1
Feed gas rate	140 to 250 TPD	200 to 650 TPD	60 to 800+ TPD
Efficiency	Good	Better	Best
Capital cost	Lower	Better	Best
Refrigerant components	N ₂	N ₂	C1
Subcooling capability	High	High	Low

FEATURES AND BENEFITS OF NITROGEN EXPANDER CYCLES

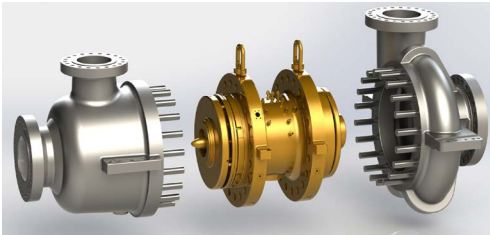
- Nitrogen rejection (to meet LNG spec of max. 1% N₂)
- Hydrogen extraction (to handle hydrogen enriched natural gas)
 - Options for extracted hydrogen include reinjection into a pipeline, use as a fuel or other

FOR REFERENCE: TABLE OF UNIT CONVERSIONS						
0	100	200	300	400	500	TPD
0	62	124	186	248	311	kUS Gal/d
0	0.04	0.07	0.11	0.15	0.18	MTPA*
0	5.2	10.4	15.6	20.9	26.1	MMSCFD
0	5.3	10.7	16.0	21.4	27.2	kMMBTU/d

*million tonne per annum

ROTOFLOW TURBOMACHINERY FOR N₂ AND C1 EXPANDERS/COMPANDERS

Building turbomachinery with high reliability, high efficiency, improved safety and lower operating costs is second nature at Rotoflow, an Air Products business. For more than 70 years Rotoflow has been building turbomachinery equipment to exacting standards. As one of the only OEMs both manufacturing and operating turbomachinery, Rotoflow intimately know the equipment and the processes. This experience allowing them to deliver turbomachinery with exceptional performance, reliability, safety, and value.



SMALL-SCALE LNG PLANT EXPERIENCE				
COUNTRY	CUSTOMER	START-UP	LNG CAPACITY (TPD)	AIR PRODUCTS PROCESS
England	British Gas Council	1981	227	AP-SMR
Japan	Japex	2004 2007	144 206	AP-N AP-N
United States	Alabama Gas Co.	1965	103	Cascade
	Massachusetts	1973	165	AP-SMR
	Hopkinton LNG	1977	392	Cascade
	Cove Point LNG	1994	310	AP-SMR
	Holtzville LNG	2001	124	AP-N
	Philadelphia Gas Works	2002	330	AP-C1
	Fields Point LNG	2022	412	AP-N

With over 3,000 units operating worldwide, Rotoflow has unique access to operating data for insights into every nuance of both equipment and processes. This operational feedback and knowledge is continuously fed into the machinery designs.

Honeywell LNG and Air Products have a strategic agreement which includes turbomachinery for small-scale LNG projects.



Rotoflow cryogenic expander installed in a small-scale LNG plant.

For more information
<https://uop.honeywell.com>

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