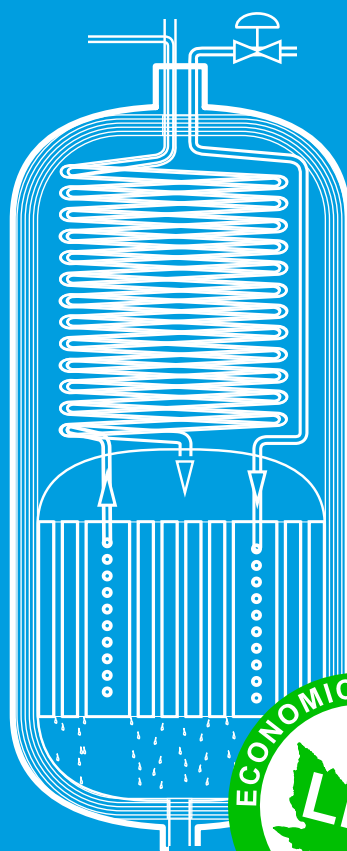


# High efficiency CH<sub>4</sub> (re)liquefaction



Liquid nitrogen (LN<sub>2</sub>) is generally easily available and is used worldwide for cooling purposes. The RLD (re-)liquefaction system combines a proprietary liquid nitrogen/methane condenser with a counter-flow heat exchanger.

By designing these compact high efficiency (re-)liquefaction units for natural gas, RLD reduced the (re-)liquefaction costs in an important manner. Compared with classic mechanical liquefaction units cost reduction can be as high as 90%!

Moreover, installation and commissioning are fast, easy and economical. The unit requires little electrical power (less than 500W) and can therefore be used in remote areas where the power grid has limitations.

RLD (re-)liquefaction unit typically uses approximately one liter LN<sub>2</sub> -or less- per liquefied liter of LNG (see tables below). Procured in larger volumes the price per liter of LN<sub>2</sub> will be extremely low (depending on monthly quantities and liquid gas suppliers). The liquefaction cost per liter of LNG will be accordingly low.

Methane feed gas specification:

- CH<sub>4</sub> > 90%
- C<sub>x</sub>H<sub>y</sub> (C<sub>2</sub> to C<sub>4</sub>) < 10%
- C<sub>x</sub>H<sub>y</sub> (C<sub>5+</sub>) < 1 ppm
- CO<sub>2</sub> < 50 ppm @ atmospheric pressure
- H<sub>2</sub>O < -70°C dew point
- H<sub>2</sub>S < 3,3 ppm
- Oil content < 0,01 mg/m<sup>3</sup>
- Particles < 0,1 micron



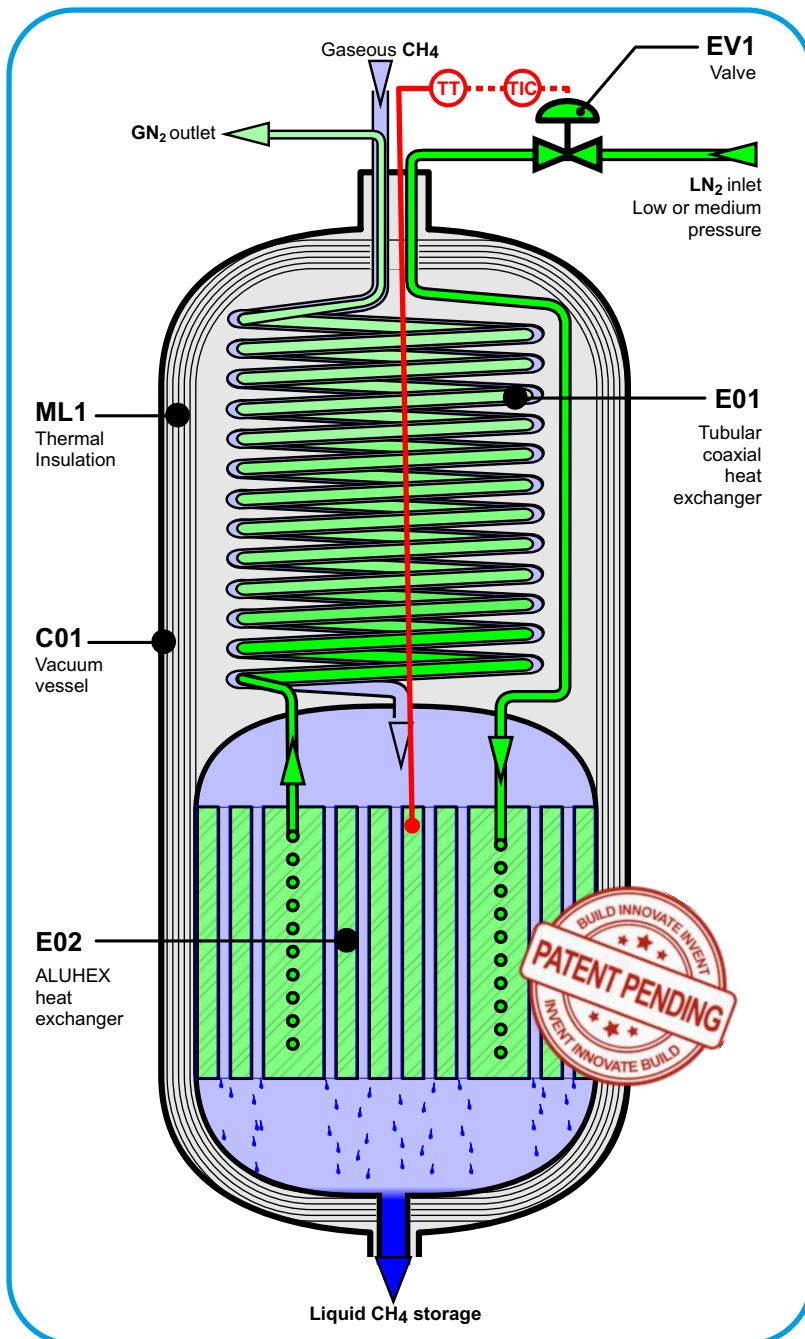
The green sign for Economical Solutions for equipment using LN<sub>2</sub> indicates products developed by of RLD Thermique - Ingénierie in Grenoble France.

Grenoble is known worldwide for high technology and innovative solutions. In addition to the local high manufacturing quality of industrial and scientific products the company RLD Thermique - Ingénierie has made it their trademark to optimize their designs for low LN<sub>2</sub> consumption combining efficiency, reliability, low maintenance and longevity.

Over 40 years experience in designing and manufacturing key elements for major international projects guarantees high quality units optimized for their intended task.

For additional information:

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design: Norman Quast - © 2016

Pressure CH <sub>4</sub>	LN <sub>2</sub> consumption @ 20°C CH <sub>4</sub> inlet temperature	
	Liters LN <sub>2</sub> /kg CH <sub>4</sub>	Liters LN <sub>2</sub> /Nm <sup>3</sup> CH <sub>4</sub>
0	3,09	2,21
3	2,84	2,03
6	2,69	1,92
10	2,55	1,82
20	2,27	1,62

Pressure CH <sub>4</sub>	LN <sub>2</sub> consumption for boil-off reliquefaction	
	Liters LN <sub>2</sub> /kg CH <sub>4</sub>	Liters LN <sub>2</sub> /Nm <sup>3</sup> CH <sub>4</sub>
0	3,41	2,43
3	2,85	2,03
6	2,55	1,82
10	2,25	1,61
20	1,73	1,24

Overall dimensions:	Diameter 700 mm.
	Height 1500 mm.
Nominal capacity:	300 Nm <sup>3</sup> /hour @ 3 barg
	375 Nm <sup>3</sup> /hour @ 20 barg.