



## CURSO DE ESPECIALIZACION

**GNL - GAS NATURAL LICUEFACTADO : DISEÑO Y OPERACION  
DE PLANTAS DE GNL Y DE REGASIFICACIÓN,  
TRANSPORTE Y COMERCIALIZACIÓN**



**Dr. Ing. Juan Israel Ortiz Guevara**





**CURSO**

**DISEÑO Y OPERACIÓN DE PLANTAS DE  
GAS NATURAL LICUEFACTADO (GNL)**



**Sesión 4A**

**GAS NATURAL LIQUEFACTADO - GNL**



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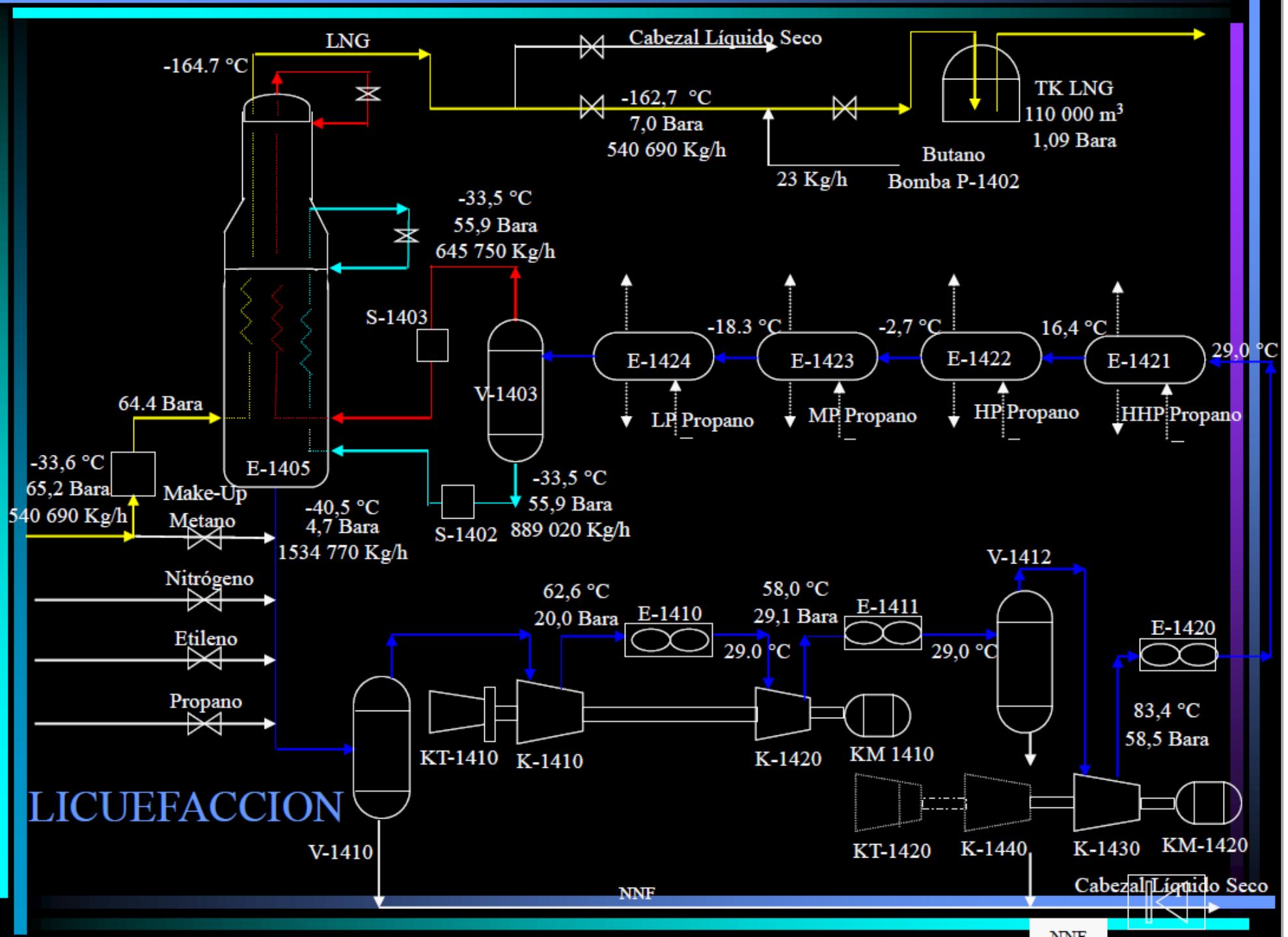
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# **Planta de Exportación Gas Natural Licuado Pampa Melchorita**

## **DESCRIPCIÓN AREA DE PROCESOS**

## GAS DE ENTRADA

Parámetro	Unidad	Especific.
Temperatura	°C	30,0
Presión	Bar	71 – 159
Flujo Másico Total (Base Seca)	Kg/h	607 370
Peso Molecular	Kg/Kg-mol	17,97
Composición:		
Metano	% Mol	87,71
Etano	% Mol	10,24
Etileno	% Mol	0,00
Propano	% Mol	0,02
Nitrógeno	% Mol	0,53
Dióxido de Carbono	% Mol	1,50
TOTAL	% Mol	100,00



## 1.0 BACKGROUND PROCESS INFORMATION

The purpose of the Liquefaction and Refrigeration Unit, Unit 1400, is to cool and liquefy treated natural gas (NG) feed from the Dehydration/Mercury Removal Units, Units 1300/1500, so that the LNG product can be rundown and stored in atmospheric LNG Storage tanks in Unit 3400.

The liquefaction process selected for this application is the Propane-pre-cooled Mixed Refrigerant (C3-MR) process. In the Liquefaction and Refrigeration Unit three process circuits can be recognized, each described separately: NG circuit, the mixed refrigerant (MR) circuit and the propane pre-cooling circuit. A defrost gas system is provided to remove moisture from all three circuits before start-up. This defrost system heats dry gas from downstream of the Dehydration unit and routes it to various places in the three process circuits.

### NG circuit

Treated NG exiting the Acid Gas Removal Unit, Unit 1100, is cooled against high pressure (HP) propane in Wet Feed / HHP Propane Vaporizer E-1401 upstream of the Dehydration/Mercury Removal Units to reduce the water load on the dehydrator beds. NG feed from the Dehydration/Mercury Removal Units is cooled further in Dry Feed / HP Propane Vaporizer E-1402, Feed / MP Propane Vaporizer E-1403, and Feed / LP Propane Vaporizer E-1404, before it is fed to the Main Cryogenic Heat Exchanger E-1405. There it is cooled, condensed and subcooled in the "warm" bundle, bottom section and the "cold" bundle top section. LNG product pressure is decreased through control valve FV-1401 (A/B) before being sent to the LNG Storage Tanks, Unit 3400.

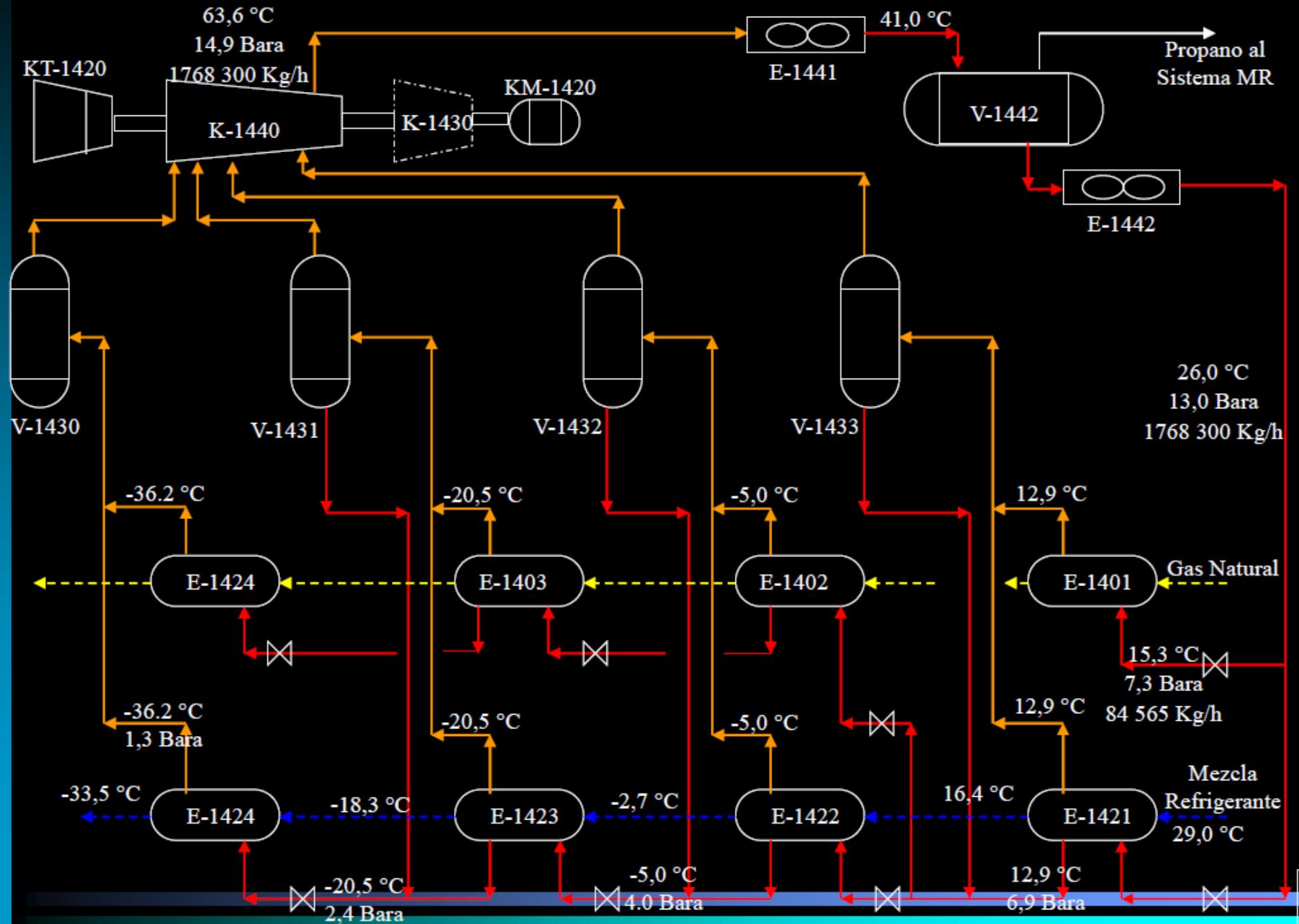
## MR Circuit

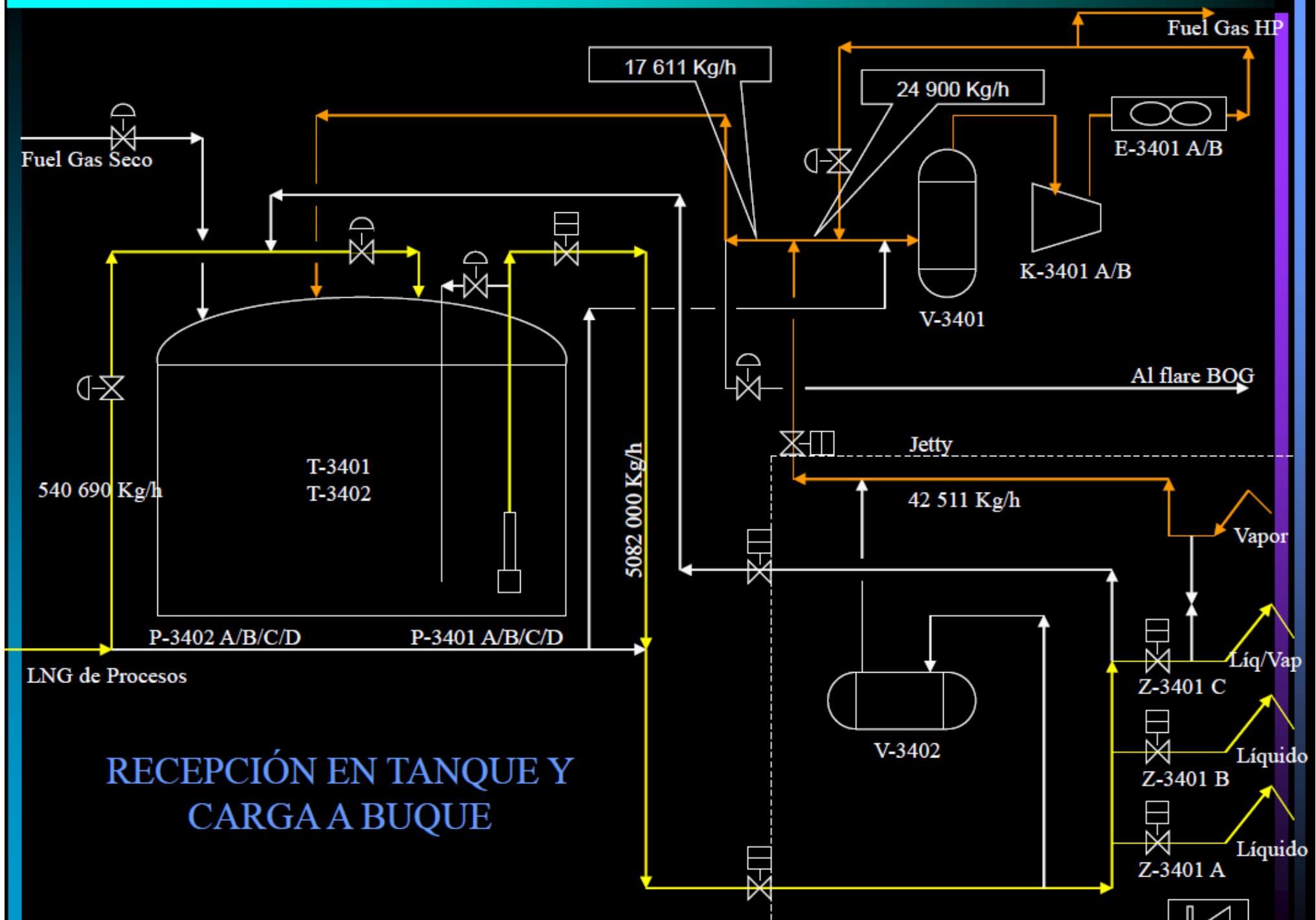
The MR circuit is a closed refrigeration loop. MR is compressed by LP MR Compressor K-1410, MP MR Compressor K-1420, and the HP MR Compressor K-1430 in series. LP MR Compressor K-1410 and MP MR Compressor K-1420 are operated at the same speed, on the same shaft driven by Gas Turbine Driver KT-1410. HP MR Compressor K-1430 is on the same shaft as the Propane Compressor K-1440, driven by Gas Turbine KT-1420. High pressure vapors are cooled in HP MR Compressor Aftercooler E-1420 and partially condensed in the respective MR / HHP, MR / HP, MR / MP and MR / LP Propane Vaporizers E-1421, E-1422, E-1423, and E-1424, and fed to the HP MR Separator V-1413. Liquid MR from V-1413 is cooled further in the "warm" bundle of E-1405, and sprayed via "warm J-T valve" FRV-1404 over the "warm" bundle of E-1405 as a cooling medium. MR Vapor from V-1413 passes through both the "warm" and "cold" bundles of E-1405 and is let down over "cold" Joule-Thomson (J-T) valve FV-1403 to reach the minimum required temperature. This MR Vapor stream is sprayed over the "cold" bundle of E-1405 as a cooling medium. Vaporized MR from E-1405 is recycled to LP MR Compressor K-1410 via LP MR Suction Drum V-1410. Make-up of MR components is injected into the MR stream to V-1410, as required.

# MEZCLA REFRIGERANTE

Componente	% Molar
Nitrógeno	17,41
Metano	31,11
Etileno	35,37
Etano	3,33
Propano	14,48
<b>TOTAL</b>	<b>100,00</b>

# SISTEMA DE PROPANO REFRIGERANTE





# LNG PRODUCTO

Parámetro	Unidad	Especif.
Temperatura	°C	-162,7
Flujo MÁSICO Total	Kg/h	540 690
Densidad @ T y P actual	Kgm <sup>3</sup>	462,5
Presión de Vapor	Bara	1,0
Peso Molecular	Kg/Kg-mol	17,57
Composición:		
Metano	% Mol	89,05
Etano	% Mol	10,38
Etileno	% Mol	0,00
Propano	% Mol	0,02
Nitrógeno	% Mol	0,54
Dióxido de Carbono	% Mol	0,01
TOTAL	% Mol	100,00