PETROKIMIA GRESIK

Best Practice

Energy Management

PT. PETROKIMIA GRESIK

Jakarta, February 3rd 2017

HISTORY OF PT PETROKIMIA GRESIK (PKG)

- PT Petrokimia Gresik is a State-Owned Enterprises (SOEs) within the Ministry of Industry and Trade, under the Pupuk Indonesia Holding Company (PIHC).
- PT Petrokimia Gresik is a complete fertilizer plants in Indonesia who work in the field of production of fertilizers, chemicals, and services.
- The project development contract was signed on August 10, 1964 and started to be emplemented on December 8, 1964. Surabaya Petrokimia Project was officially inaugurated by the President of Republic of Indonesia on July 10, 1972 that later is commemorated as the Anniversary of PT. Petrokimia Gresik.

PETROKIMIA GRESIK

Memupuk Kesuburan, Menebar Kemakmuran

- Project Petrokimia Surabaya 1963 – 1971
- Public Company 1971 – 1975
- PT Petrokimia Gresik (Limited Company) 1975 – 2012
- PT Petrokimia Gresik (Subsidiary of PT. Pupuk Indonesia) 2012 s/d now

Production Capacity

PETROKIMIA GRESIK

PLANT	AMOUNT	CAPACITY	YEARS OF OPERATION
Urea Fertilizer	1	460.000 ton/year	1994
Fosfat / SP36 Fertilizer	1	500.000 ton/year	2009
ZA Fertilizer	3	750.000 ton/year	1972, 1984, 1986
NPK Fertilizer (2.700.000 ton/year)			
details : Phonska I	1	450.000 ton/year	2000
Phonska II & III	2	1.200.000 ton/year	2005, 2009
Phonska IV	1	600.000 ton/year	2011
NPK I	1	90.000 ton/year	2005
NPK II	1	120.000 ton/year	2008
NPK III & IV	2	240.000 ton/year	2009
K2SO4 (ZK) Fertilizer	1	10.000 ton/year	2005
Petroganik Fertilizer	1	10.000 ton/year	2005
The Amount of Fertilizer Plant/Capacity	**15**	**4.430.000 ton/year**	
Ammonia	1	445.000 ton/year	1994
Sulfuric Acid (98% H_2SO_4) – SA I	1	570.000 ton/year	1985
Sulfuric Acid (98% H_2SO_4) – SA II	1	600.000 ton/year	2015
Phosphoric Acid (100% P_2O_5) – PA I	1	200.000 ton/year	1985
Phosphoric Acid (100% P_2O_5) – PA II	1	200.000 ton/year	2015
Cement Retarder	1	440.000 ton/year	1985
Purified Gypsum I	1	200.000 ton/year	1985
Purified Gypsum II	1	600.000 ton/year	2015
Aluminium Fluoride	1	12.600 ton/year	1985
The Amount of non-Fertilizer Plant/Capacity	**9**	**3.267.600 ton/year**	
Total Plant/Capacity	**24**	**7.697.600 ton/year**	

Energy Sources at PKG

PETROKIMIA GRESIK

Natural Gas

Electricity (PLN)

Coal

Diesel Fuel

Fuel Oil (MFO)

Raw Materials

Generated steam

Generated Electricity

Fuel

Top Level Management Commitment on Energy Policy

PETROKIMIA GRESIK

PETROKIMIA GRESIK

Kebijakan Sistem Manajemen PT Petrokimia Gresik

PT Petrokimia Gresik bertekad menjadi produsen pupuk dan produk kimia lainnya yang berdaya saing tinggi dan produknya paling diminati konsumen dengan kinerja unggul dan berkelanjutan, melalui penerapan berbagai sistem manajemen antara lain : Sistem Manajemen Keselamatan dan Kesehatan Kerja, Sistem Manajemen Keselamatan Proses, Sistem Manajemen Lingkungan, Sistem Manajemen Mutu, Sistem Manajemen Energi, Sistem Jaminan Halal, serta Sistem Manajemen Keamanan Pangan secara terintegrasi dengan komitmen :

1. Menempatkan Keselamatan, Kesehatan Kerja dan Lingkungan Hidup (K3LH) sebagai prioritas utama dalam setiap aktifitas.
2. Mencegah kecelakaan dan penyakit akibat kerja serta kerusakan sarana dan prasarana dengan menghilangkan atau mengurangi risiko melalui analisa dan pengendalian semua potensi bahaya serta peningkatan kompetensi karyawan sehingga tercipta budaya dan sistem kerja yang aman.
3. Melakukan pengelolaan dan perbaikan lingkungan secara terus-menerus guna mencegah dampak pencemaran lingkungan signifikan dengan upaya penurunan emisi Gas Rumah Kaca (GRK), limbah cair, limbah padat dan kebisingan; pengurangan dan pemanfaatan limbah B3 dan non B3; perlindungan keanekaragaman hayati, konservasi air; serta menerapkan *Reduce, Reuse, Recycle, Recovery* (4R).
4. Menjamin kepuasan pelanggan dengan menyediakan produk pupuk, produk kimia dan jasa secara tepat mutu, tepat jumlah, tepat jenis, tepat tempat, tepat waktu, dan tepat harga. Menjamin kehalalan sesuai syariat Islam dan keamanan produk (kategori *food grade*) secara konsisten dan terus-menerus.
5. Menaati dan mematuhi Peraturan Perundangan dan persyaratan lainnya yang berlaku; tanggap terhadap isu-isu K3, lingkungan global, konservasi sumber daya alam dan efisien energi; mengembangkan budaya inovasi dan berbagi pengetahuan; mengembangkan komitmen terhadap masyarakan dengan menerapkan *Responsible Care* dan *Corporate Social Responsibility* (CSR).

Kebijakan ini dikomunikasikan kepada seluruh karyawan, rekanan, pemasok dan pemangku kepentingan lainnya untuk dipahami dan keefektifannya ditinjau secara berkala sekurang-kurangnya satu kali dalam setahun.

Gresik, 16 Januari 2015
PT Petrokimia Gresik

PETROKIMIA GRESIK

Ir. Hidayat Nyakman
Direktur Utama

PT. PKG determined to become producers of fertilizers and other chemical products that are highly competitive and its products are the most popular consumer with superior performance and sustained, through the implementation of various management systems, among others: Health and Safety Management System, Process Safety Management System, Environmental Management System,Quality Management System, Energy Management Systems, Halal Assurance System, and Food Safety Management System is an integrated.

CORPORATE ENERGY ACTIONS

Based on PP. 70/2009 energy users that consume ≥ 6,000 TOE* per year must conduct energy conservations through energy management, PKG had implemented :

a. Appointed energy managers on the organization structure (2010)

b. Arranged energy conservation programs (since 2011)

c. Implementing the energy audits regularly (2011 & 2012, **2016**)

d. Energy Manager and Energy Auditor Certification (2013, 2014, **2015)**

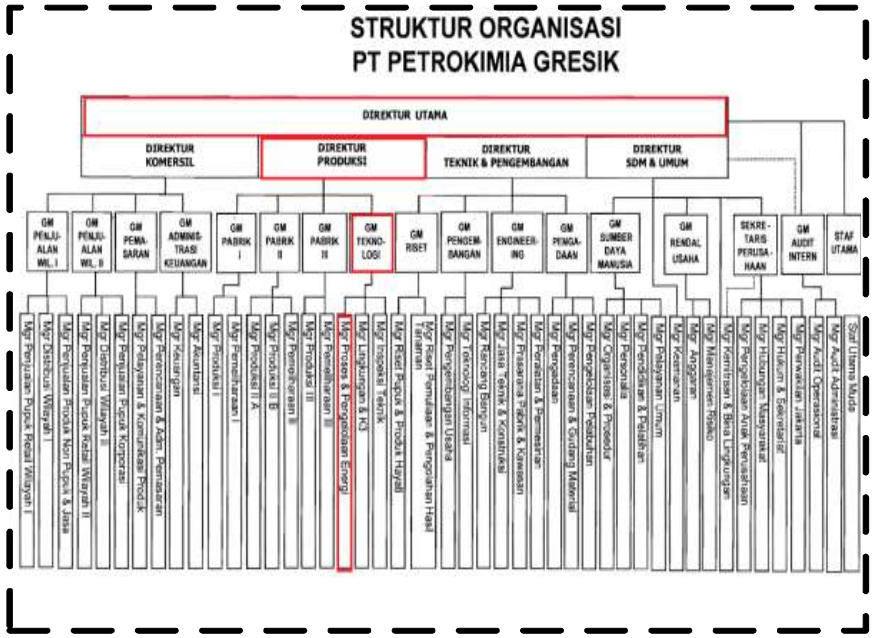
e.Implementing the energy audit recommendations (2012, 2014, **2016)**

f. Reported the implementation of energy conservation annually to the Energy Minister, Governor or Mayor (2011 up to now)

Energy Manager on the Company Organizational Structure

PETROKIMIA GRESIK

In the implementation of government regulation PP 70/2009, PKG has designated energy management manager into the company organization structure to perform evaluation on energy audit/conservation programs.



President Director

Production Director

GM of Technology

Mgr of Environment & Safety

Mgr of Process & Energy Management

Mgr of Technical Inspection

Energy Staff

Process Evaluation Staff

PETROKIMIA GRESIK

ENERGY CONSERVATION

With the development of the company and limited sources of energy and the high cost of energy, requires PT. PKG make efforts in energy saving and sustainable programmatically.

Energy Conservation in PT. PKG include:

- Energy Conservation in Plant
- Energy Conservation in Buildings and Offices

PETROKIMIA GRESIK

Energy Conservation in Plant

Consist of two conservation areas which are:

I. Using alternative fuels (Coal, Renewable Energy)

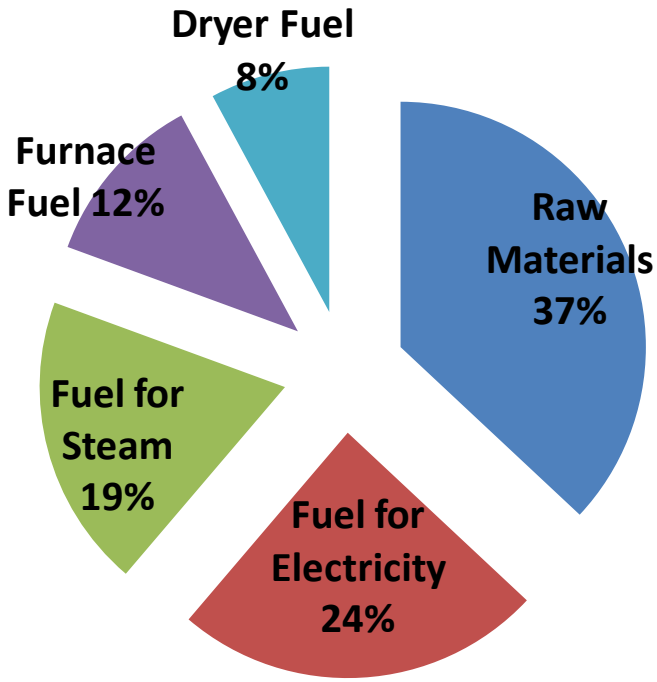
II. Optimization of Process and Equipment Efficiencies, and reduce Energy Loss

ENERGY COST

PETROKIMIA GRESIK

Fuel	Price	Caloric Value	Energy Cost (IDR/MMBTU)	Ratio to Gas
Natural Gas	6 USD/MMBTU 80.000 IDR/MMBTU		80.000	1
Coal	460.000 IDR/Ton	3900 kcal/kg 15,44 MMBTU/Ton	33.800	0.4
Diesel Fuel	9.346 IDR/litre	9195 kcal/l 11.400 kcal/kg $3.64.10^{-2}$ MMBTU/l	247.252	2.9

- The cheapest fuel price is coal.
- Energy policies in PKG : to utilize as much as possible the use of Natural Gas and energy diversification to Coal.



PETROKIMIA GRESIK

Natural Gas

Feed Stock	Fuel	Furnace	Dryer	Emergency & Start-Up
• Ammonia Plant	• GTG • Steam for Electricity • Steam for Processes	• Pabrik Amoniak (101-B) • ZK Plant (13.R.101)	• Phonska I/II/III • NPK II/III/IV • PF I/ PF II • AlF3 (B.3101) • CR (B.4201) • ZA II (B.5601)	• Ammonia Plant (102-B) • Incenerator Tank Yard • Start-Up SA Plant (E.1205)

Do : Substitution of Natural Gas (NG) to Coal

PETROKIMIA GRESIK

Plant	Program	Work Plan	Energy Saving
Plant III			
Coal Energy Conversion 2011	Build the capacity of 33 MW STG unit and steam generation 2x150 ton/hour	• Diversion of natural gas to coal needs. • Decreased load GTG from 21 MW to 17 MW. • Minimum load for NG Boiler B-1102. • Minimum load for NG Boiler B-6201/6203 (Utilitas III). • No operation for 09.B101, 02.B911, 03.B911 (standby).	Equivalent to the use of NG 1.8 MMSCFD. Equivalent to the use of NG 4 MMSCFD. Equivalent to the use of NG 1.3 MMSCFD. Equivalent to the use of NG1.2 MMSCFD. Equivalent to the use of NG 1.2 MMSCFD.

Do : Fuel Optimization

PETROKIMIA GRESIK

Program	Potential for Energy Savings	Work Plan	Progress
Minimize / eliminate the use of MFO	• MFO average consumption of 954.1 m3/month, equivalent 31.21 MMSCF/month. • Potential fuel cost savings of switching to natural gas is Rp. 4 billion/month. • Potential fuel cost savings of switching to coal is Rp. 4.5 billion / month.	Modification of the furnace B-4201 at Cement Retarder Plant from MFO to Gas and Coal.	Since August 2012 MFO are not used anymore

Energy Management

Check & Action

PETROKIMIA GRESIK

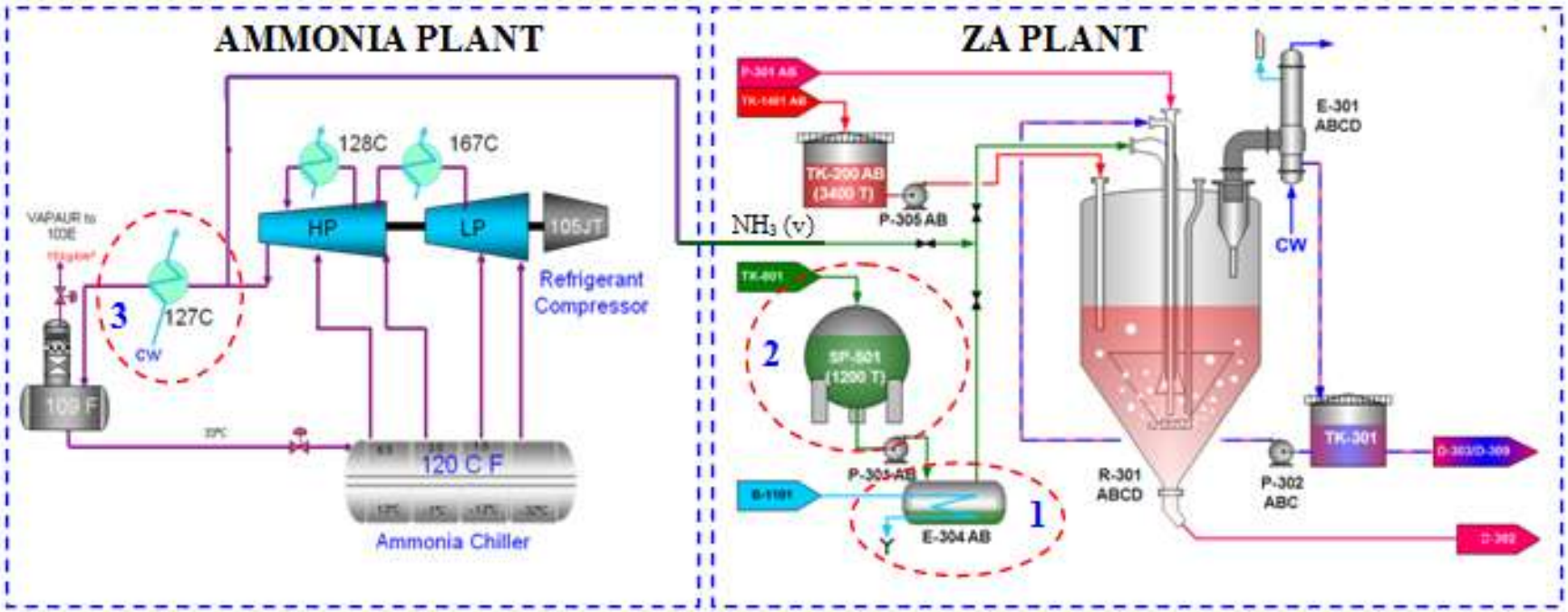
Program	Potential for Energy Savings	Work Plan	Progress
Improvement of coal to steam efficiency (Coal Utility Plant)	Theoretically, an increase of 1% efficiency savings of coal equivalent of 1.25%.	• Minimize lost heat to the stack with an indication of the increase in the exit flue gas temp. The simulation results, an increase of 10°C impact on reducing eff. 0.94%. • Replacement of the type of sonic soot blower to the type of steam	• Has performed the replacement of the type sonic soot blower to the type of low-pressure steam. • Of the 28 ea, already 22 ea replaced.

Energy Conservation Project

PETROKIMIA GRESIK

"Interconnection of Ammonia Vapor from Ammonia Plant to ZA I / III Plant"

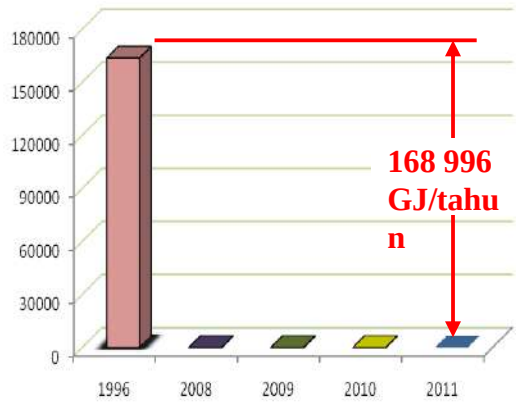
- ZA Plant (ammonium sulfate) produced from a chemical reaction between Sulfuric Acid and Ammonia vapor. Liquid ammonia supply derived from ammonia storage tank is transferred with a pump system. Then, Ammonia Vaporizer is responsible for the phase change of Ammonia Liquid to Ammonia vapor using steam as the heating media, then ammonia vapor is fed to saturator (reactor).
- The project was the modification of liquid ammonia feeding to ZA I/III Plant replaced with Ammonia Vapor by making interconnection from Ammonia Plant.



Energy Savings

PETROKIMIA GRESIK

1. Energy reduction in Evaporator



- Before the project steam was used as the heating media in the vaporizer for evaporating liquid ammonia into ammonia vapor.
- After the project then practically no more steam need to use in the vaporizer.
- **The energy savings obtained to reach 168.998 GJ/year.**

2. Liquid ammonia transfer pump did not operate

- With the new line of ammonia vapor, the liquid ammonia pump is not running at normal operation. This provides benefits in terms of power consumption of electric motor pumps.
- **The energy savings obtained to reach 7.413 GJ/year.**

Parameter	Before	After
Flow NH3 vapour (m^3/hour)	13	0
Discharge Pressure (kg/cm2G)	7	7
Power Consumed (kW)	13	0
Saved Energy (GJ/year)	**7.413**	
Saved Cost (IDR/year)	226.787.932	

Energy Savings

PETROKIMIA GRESIK

3. Heat exchanger duty (Condenser 127-C) in the plant Ammonia refrigeration unit is reduced, impact on the increasing energy efficiency Ammonia plant

- Load heat exchanger (127-C) in the plant Ammonia refrigeration unit reduced due to delivery of ammonia vapor to ZA plant so that cooling water consumption in the exchanger also decreased.
- **The energy savings obtained to reach 7.413 GJ/year.**

Parameter	Before	After
Flow NH3 vapour (kg/hour)	65.554	50.034
Inlet Temperature (°C)	107.2	107.2
Outlet Temperature (°C)	36.7	36.7
Heat Exchanged (MJ/hour)	86.310	65.669
Energy Saved (MJ/hour)	20.369	
Energy Saved (GJ/year)	**161.324**	

Energy Conservation Project

PETROKIMIA GRESIK

"Process Optimization on High Pressure Steam Substitution to Medium Pressure Steam in Mol Sieve Regen Heater 173-C at Ammonia Plant"

Winner for the ASEAN Energy Awards (AEA) 2016 in the Energy Management for Buildings and Industries Awards,
Industry Special Submission Category

PROCESS OPTIMIZATION ON HIGH PRESSURE STEAM (HPS) SUBSTITUTION TO MEDIUM PRESSURE STEAM in MOL SIEVE REGEN HEATER 173-C at AMMONIA PLANT

PETROKIMIA GRESIK

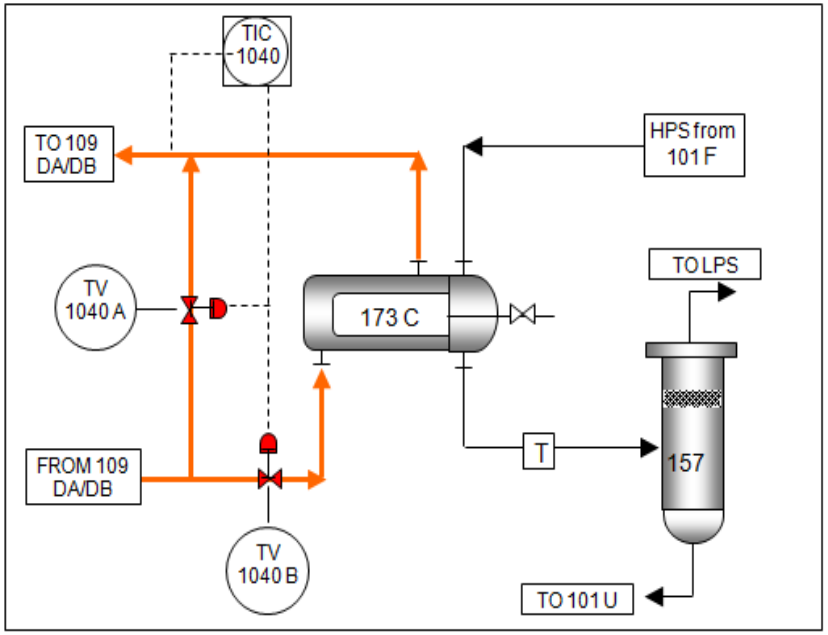
- Molecular Sieve Drier (109-DA/DB) are two horizontal vessel containing a molecular sieve adsorbent, operating interchangeably, for removing water and CO_2 in the Synthesis Gas before entering the Syn Loop to less than 1 ppm.
- The heat needed for regeneration (on heating step). Originally steam was obtained from High Pressure Steam (HPS) in heater 173-C.

Mol Sieve Regen Heater 173-C

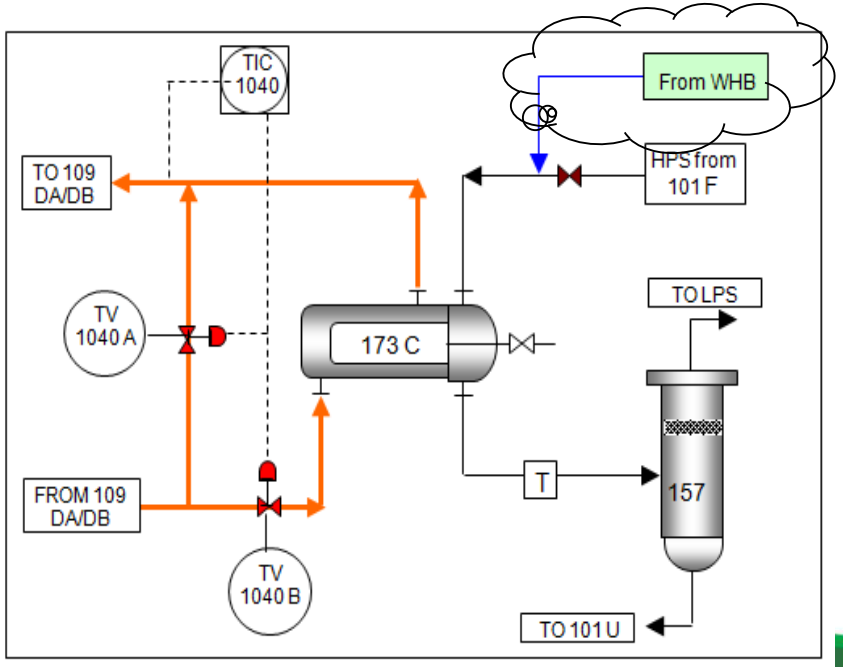
Molecular Sieve Dryer 109-DA/DB

1. Energy saving

- Condition before the project the amount of HPS that can be produced only ± 185 tons/hour (compared to HPS production when the performance test by 210 tons/hour) with a pressure 122 kg/cm^2, so HPS as a driver of Turbine Compressor became lesser.
- To improve this, steam heating at 173-C which was originally used HPS from Ammonia Plant, replaced with Medium Pressure Steam (MPS) from Waste Heat Boiler (WHB) of Gas Turbine Generator which had pressure 65 kg/cm^2.



Before Modification



After Modification

PETROKIMIA GRESIK

Total energy saving with substitution of High Pressure Steam (HPS) to Medium Pressure Steam (MPS) as the heating in Mol Sieve regen Heater 173-C Ammonia Plant reached **47.172 MMBTU/year or equivalent to 49.808 GJ/year or equivalent to IDR 3,85 Billion/year**.

Total energy saving :

47.172 MMBTU/year or equivalent to **49.808 GJ/year**

2. Impact to The Environment

- Sustainability of performance as well as to implement the program in reducing Greenhouse Gas (GHG) that make every effort possible to participate by identifying sources of GHG emissions regularly and continuously to innovate and establish programs that are closely related to a decrease in GHG. **With this innovation, PKG has succeeded to reduce GHG emission by 2,792 ton**.
- Waste processing in PKG has complied with the applicable provisions according to examination result performed by Ministry of Environment through Company Performance Rating Program (**PROPER**) where PKG received **Blue rating** (2012 - 2016) and also received **Green Industry Award Level 5** held by the Ministry of Industry.


KEMENTERIAN LINGKUNGAN HIDUP DAN KEHUTANAN

MENGANUGERAHKAN PENGHARGAAN
PROGRAM PENILAIAN PERINGKAT KINERJA PERUSAHAAN
DALAM PENGELOLAAN LINGKUNGAN HIDUP

PROPER

PERINGKAT
BIRU

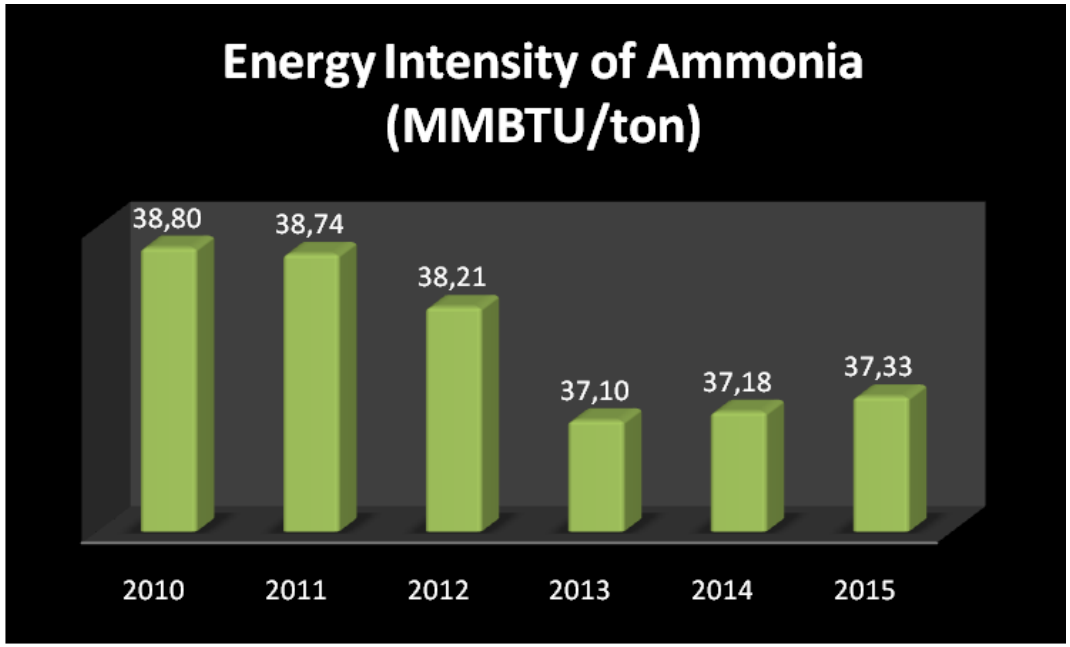
PT. Petrokimia Gresik

Blue Rating PROPER Award from Ministry of Environment

Green Industry Award from Ministry of Industry

3. Energy Consumption Intencity

PETROKIMIA GRESIK



The modification of substitution High Pressure Steam (HPS) into Medium Pressure Steam (MPS) as the heating in 173-C Ammonia Plant will indirectly affect on energy intensity of Ammonia plant. Energy ratio presented in above, energy utilization **intensity decreased during last 5 (five) years.**

PETROKIMIA GRESIK

Energy Conservation in Building and Offices

- Mapping on the Building and the Office : air conditioning and lighting. The intensity reached 7.97 KWh/m2/month.
- TL lamp type replace with LED/TSL type gained energi saving up to 10%.
- Conducting energy saving campaign.

PETROKIMIA
GRESIK

Thank you