Improvement on Energy Efficiency and Conservation in Fertilizer Plant by Establishment of Energy Management System
The member of:

PUPUK INDONESIA HOLDING COMPANY

Bontang

December 7th, 1977

Vision

To become a growing and sustainable world-class Company in the fertilizer, chemical and Agrobusiness industry

Main Products

Urea

Ammonia

NPK

Main Products

Urea Plants
3.4 million tons/year

Amoniak Plants
2.7 million tons/year

NPK Plants
350 thousand tons/year

Baldridge Excellence Framework

Energy Performance

3 of 5 Ammonia-Urea plants are ISO 50001 certified

35% products for subsidies in 2/3 of eastern Indonesia
Energy source: Natural Gas

PLANTS IN PUPUK KALTIM

PKT-2 : 1984
Energy consumption:
Ton Oil Equivalent (TOE) 366,566

PKT-3 : 1989
Energy consumption:
Ton Oil Equivalent (TOE) 183,131

PKT-4 : 2002
Energy consumption:
Ton Oil Equivalent (TOE) 221,828

PKT-1A : 2014
Energy consumption:
Ton Oil Equivalent (TOE) 229,692

PKT-5 : 2015
Energy consumption:
Ton Oil Equivalent (TOE) 269,543

Total energy consumption (TOE) 1,270,761

Note: Based on 2019 data and exclude energy as raw material
ENERGY MANAGEMENT
SYSTEM DRIVERS

Reduction of production cost
Energy costs account for 40% of production costs | increase in natural gas prices | The price of products on the market fluctuates

Comply to government regulation
PP 70/2009 (about energy conservation) | Permen ESDM no. 14/2012 (about energy management) | Participate in Nationally Determined Contribution (NDC) to reduce CO₂ emissions

Integration and Sustainability
Ensure the sustainability of existing efficiency programs | integrate with other management systems

Enhance the company's reputation
to support the achievement of the vision and mission
ISO 50001 IMPLEMENTATION ROADMAP

TARGET
Savings of 3% by 2021 across all Ammonia-Urea-Utility plants

- 2015: Corporate Energy Policy Legalization and Tim Formation
- 2016: EnMS ISO 50001 Implementation System Set Up
- 2017: PKT-3 ISO 50001 Certification
- 2018: PKT-1A ISO 50001 Replication and Certification
- 2019: PKT-4 ISO 50001 Replication and Certification
- 2021: NPK Plant & Coal Steam Generation ISO 50001 Replication and Certification

TARGET: Savings of 3% by 2021 across all Ammonia-Urea-Utility plants
ENERGY MAPPING

Level-1

PKT-4

\[ Y = 12.37A + 10.51B + 109.026 \]
Regression

MMBTU

Level-2

AMMONIA

\[ Y = 9.54A + 71.006 \]
Regression

MMBTU

UREA

\[ Y = 4.09A + 11.270 \]
Regression

MMBTU

UTILITY

\[ Y = 0.01A + 3.31B + 10.660 \]
Regression

MMBTU

Level-3

Ammonia - Thermal

\[ Y = 6.57A + 77.072 \]
Regression

MMBTU

Ammonia - Power

\[ Y = 0.72A + 1.011 \]
Regression

MMBTU

Urea - Thermal

\[ Y = 3.26A + 306 \]
Regression

MMBTU

Urea - Power

\[ Y = 0.83A + 10.964 \]
Regression

MMBTU

Utility - Thermal

\[ Y = 0.62A + 2.987 \]
\[ Y = 0.5A + 5.853 \]
Regression

MMBTU

Utility - Power

\[ Y = 0.002A + 2.989 \]
Regression

MMBTU

SEU

- 39% Primary reformer
- 61% Semi lean solution pump
- 50% CO2 compressor turbine
- 21% HP ammonia pump
- 61% Desal A/B

- 22% Syngas compressor turbine
- 13% Lean solution pump
- 30% HP stripper
- 16% Atomization air blower
- 18% BFW pump turbine

- 13% Process air compressor turbine
- 9% Flue gas blower
- 13% Fluidization air fan
- 15% NH3 SCW pump

60% Sea water pump
TANGIBLE BENEFITS

Cumulative Sum (CUSUM) of Energy Saving in period 2016 – Oct 2020 (expressed in GJ and $USD)

Cumulative Sum of CO₂ Reduction Profile in period 2016 – Oct 2020 (expressed in ton CO₂ eq)

Energy Efficiency Index of Ammonia and Urea (expressed in mmbtu/ton)
Inspire the Holding Company to implement EnMS in all subsidiaries

Increase energy-saving culture through energy efficiency innovations

Increase competitiveness in the global market, especially in countries that care about the environment and energy

Since 2017, Pupuk Kaltim has received Gold Medal—the highest award in National Program for Assessment of Company’s Performance Rating in Environmental Management out of 1906 industry participate in national level

Achievement as world class industry by Global Performance Excellence Award (GPEA) in 2018 and 2019
ENERGY MANAGEMENT PROGRAM

**Operational Program**
- New best practices
  - Reduce O₂ excess
  - Reduce S/C ratio
  - Off gas utilization
  - Methane slip optimization
- Reduce O₂ excess
- Reduce flue gas temperature
- Predictive and preventive maintenance based on ISO 55001
- SEU’s online monitoring
- Procurement based on Life Cycle Cost Analysis

**Investment Program**
- Upgrade the type of Ammonia Converter (Reactor)
- New equipment: LP Ammonia Scrubber
- Upgrade pump to IE3 based

**Turn Around Program**
- High catalyst replacement efficiency due to implementation of LCA Analysis
- Chemical and mechanical cleaning
- Rotating equipment overhaul
KEY SUCCESS FACTORS

Integration with existing management systems
Manufacturing excellence | ISO 55001 | focus on day-to-day operational control

Competent team
Energy manager | Energy auditor | 5 Energy auditor | competent and certified operator

Top management commitment
Dedicated team | budget provision | innovation policy and reward system

Strong driving force
Cost reduction | increase in natural gas prices | business continuity

Operational control based on industry 4.0
KOP and SEU online monitoring | threshold limit and alarm

Data availability and accuracy
DCS and e-log sheet | accuracy with ISO 17025 certification

Detail energy baseline
Based on ISO:50006/SNI 8669:2018 level
3, EnPI type 3 (regression method) | SEU is identified down to equipment
Thank You

......and may we all conquer the pandemic together