Implementation of Energy Recovery and Renewable Energy Plan of PT KRAKATAU POSCO

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- Implementation of Energy Recovery
- Renewable Energy & Green Steel Industry Road Map
- Conclusion

Introduction

- **PT KRAKATAU POSCO (PTKP**) was established on 26th August 2010, located at Cilegon, Indonesia.

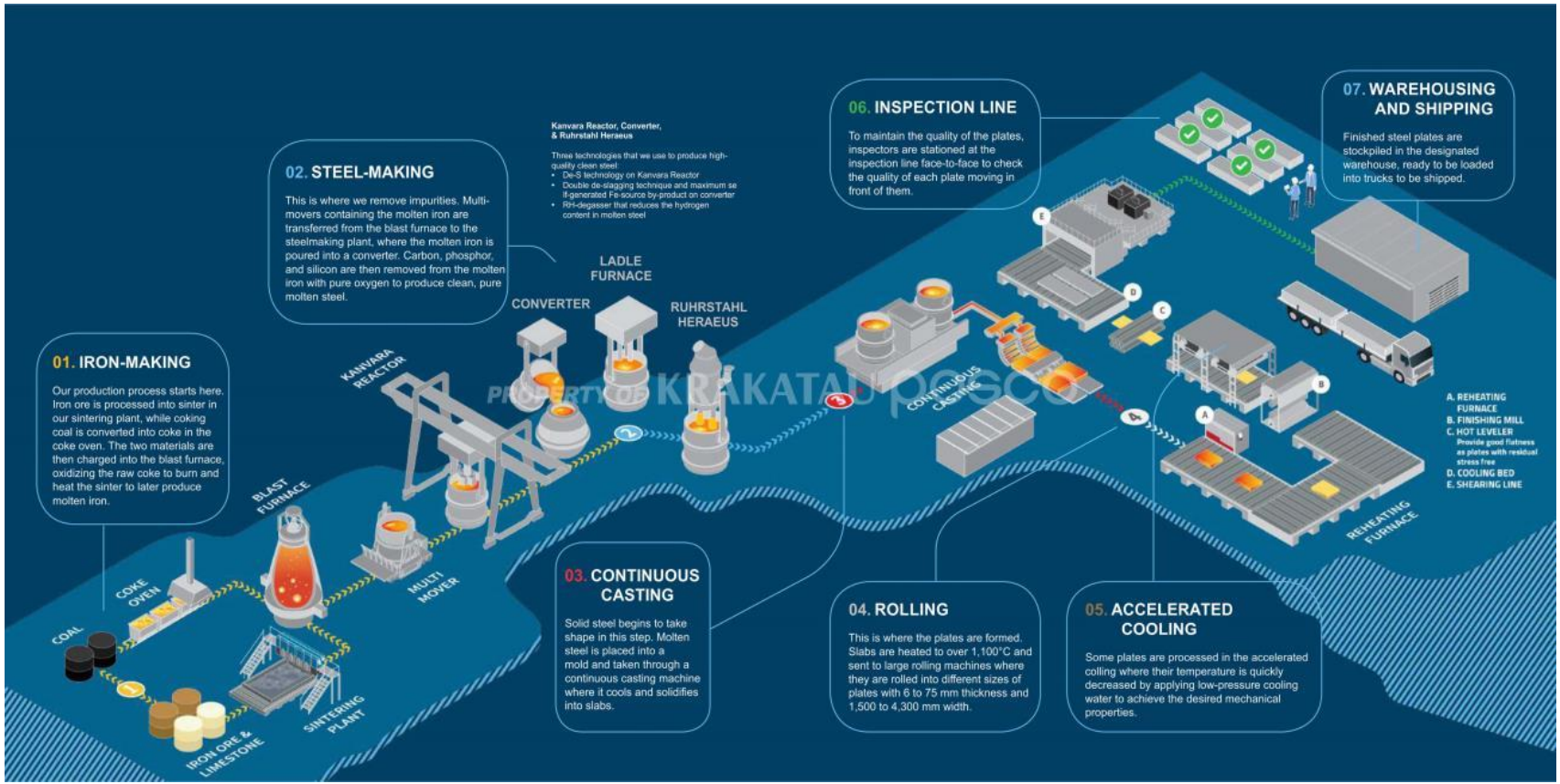
- Joint venture Integrated Steel Mill company between **PT. Krakatau Steel**, an Indonesia State-Owned Steel Maker and world's most competitive Steel Maker from South Korea, **POSCO**

- Using the best steel industry technology with **three million ton a year of capacity**, PTKP is ready to provide the **best slab and plate products**.

- For the long term plan PTKP production capacity will increase in term of upstream and downstream facilities in purposely towards the most competitive steel producer in the world.

- Nowadays by having fully support from Indonesia Government, PTKP together with the shareholders, **POSCO** and **PT. Krakatau Steel** will conduct business expansion into **10 million steel cluster in Cilegon** which divided into second and third phase.

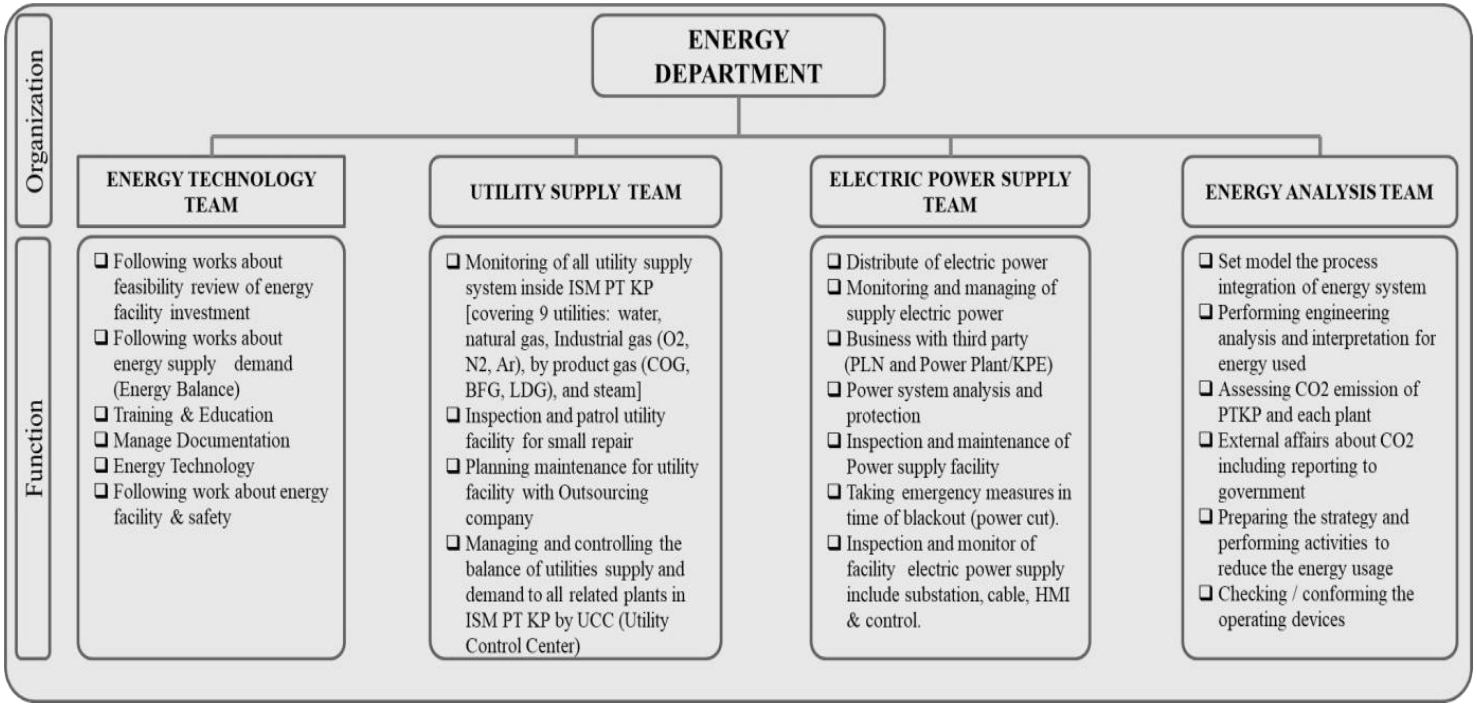
Integrated Steel Mill PTKP



Energy Supply and Demand Overview

KRAKATAU POSCO

PTKP, in relation with Good Corporate Governance compliance, PTKP create a specific unit for managing company energy supply and demand, which is belongs to Energy Department.



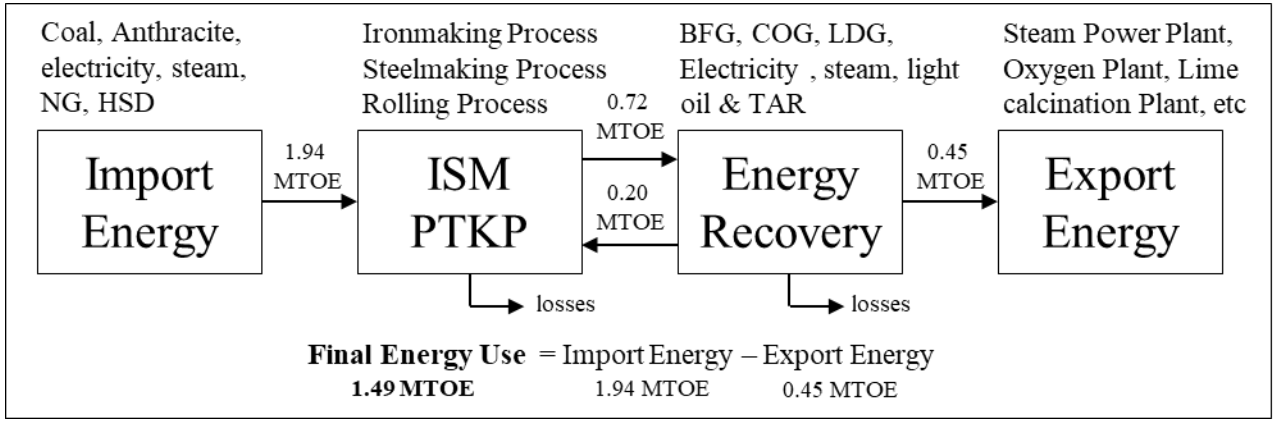
Energy Supply and Demand Overview

KRAKATAU POSCO

- PTKP for one year operation requires purchasing energy **(import energy**) as much **1.94 MTOE** of energy. This imported energy consists of coal, anthracite, electricity, steam & high speed diesel.

- By utilizing those imported energy, it can generates **energy recovery** as much **0.72 MTOE** through the production process.

- PTKP also providing energy sales **(export energy**) to outsourcing company around ISM area as much **0.45 MTOE** consists of byproduct gas, BTX, TAR, steam and electricity.



Energy Supply and Demand Overview

PTKP have been doing energy conservation activities to reduce energy cost, improve Thermal, Mechanical / Electric equipment efficiency, etc. The list of improvement activities and result:

Activities	Improvement	Result
Reduce PLN cost during Steam Power Plant overhaul	Adjust overhaul schedule, electricity, fuel saving, maximize P/P operation	Reduce cost about 1.5 MUSD
Increase Steam Recovery from Waste heat boiler	Adjust parameter operation	Steam Recovery increase 7 ton/hour
Reduce lighting tax cost by control Steam Power Plant Operation	Control electricity generation to reduce excess power to Grid	Reduce cost about 1 MUSD/Year
Increase Reverse Osmosis (RO) water production	Restoration RO membrane and install new #4 rain water pit	Increase RO water production 600 m^3/Day
Converting LPG to Natural Gas as gas fueled at PTKP Workshop	Make a new NG pipeline to Workshop	Reduce LPG saving 514 Gcal/yrs (51.4 TOE/Year)
Fuel Consumption Reduction in Coke Oven Battery	Adjust excess air and leakage repair	Reduce fuel consumption, about 29,786 Gcal/Year
Electricity Saving in Air Compressor system - All PTKP Plant	Installment of additional windows in compressor room – Plate Mill ultrasonic inspection to find and repair the leakage point.	Achieve electricity saving 49.000 kWh/ month (147 TOE / Year)
Tundish Preheating Optimization	Reduce operation burner from 3 into 2 burners	Reduce fuel consumption from Tundish. Saving COG 1,016 Gcal/Year
Steam Saving in Distribution Pipeline	Perform steam audit to find and repair leakage point	Achieve steam saving 4,462 ton / month (339 TOE / Year)
Reducing the operational energy cost of Cooling Tower facility	Turning off 1 Cooling Tower Fan for 6 Hours, starts in : 00.00 AM	Achieve electricity saving 13.000 kWh / month (39 TOE / Year)
Air Ratio Improvement RF plate Mill zone 1 & zone 2	Air ratio parameter adjustment	Achieve COG saving 4,220 Gcal/yrs (422 TOE/Year)
Cooling load analysis in office Building and electrical	Turning off 70 unit of unnecessary AC, from total 160 AC installed	Achieve electricity saving 300,000 kWh / month (900 TOE / Year)

Implementation of Energy Recovery

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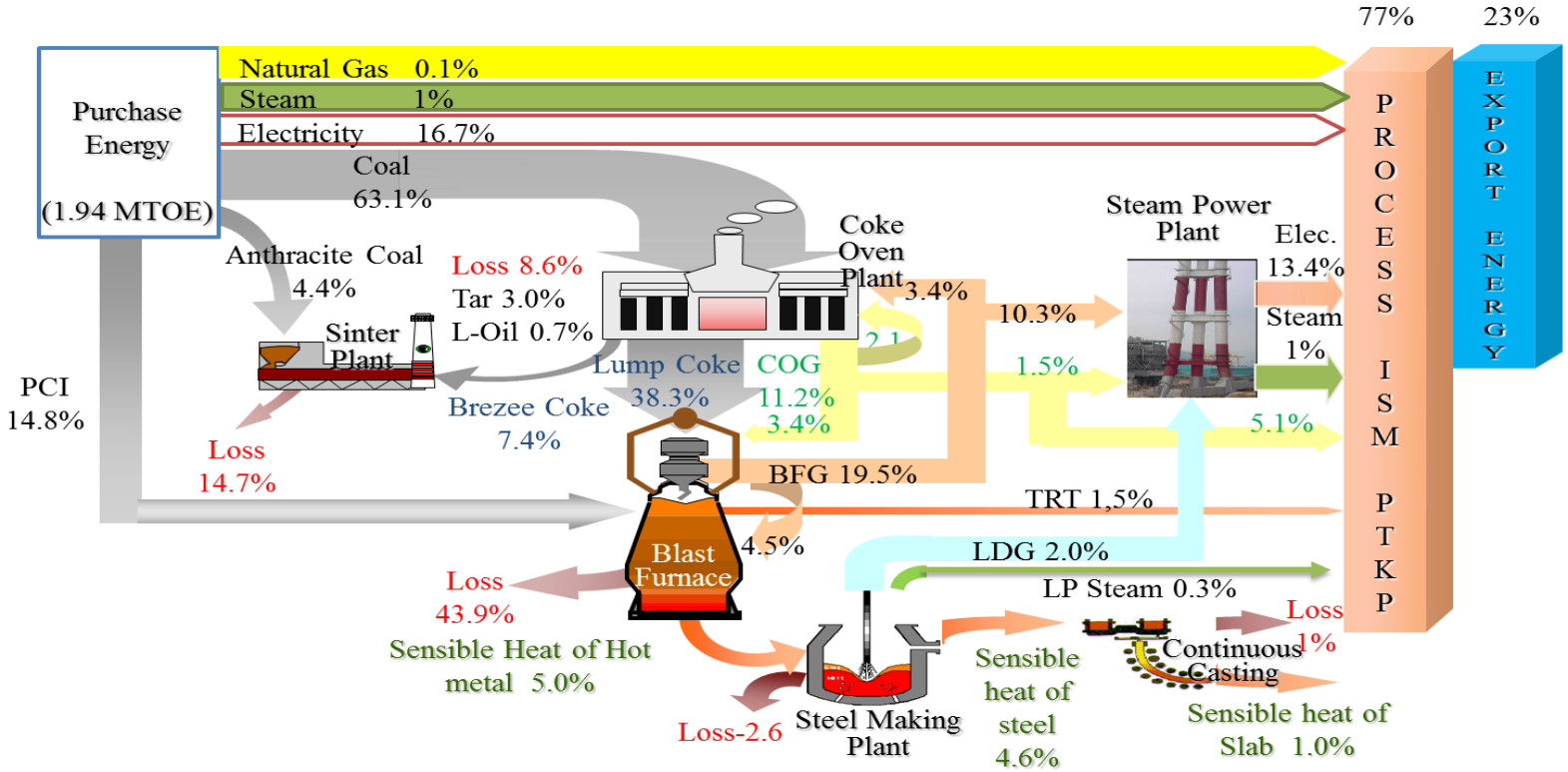
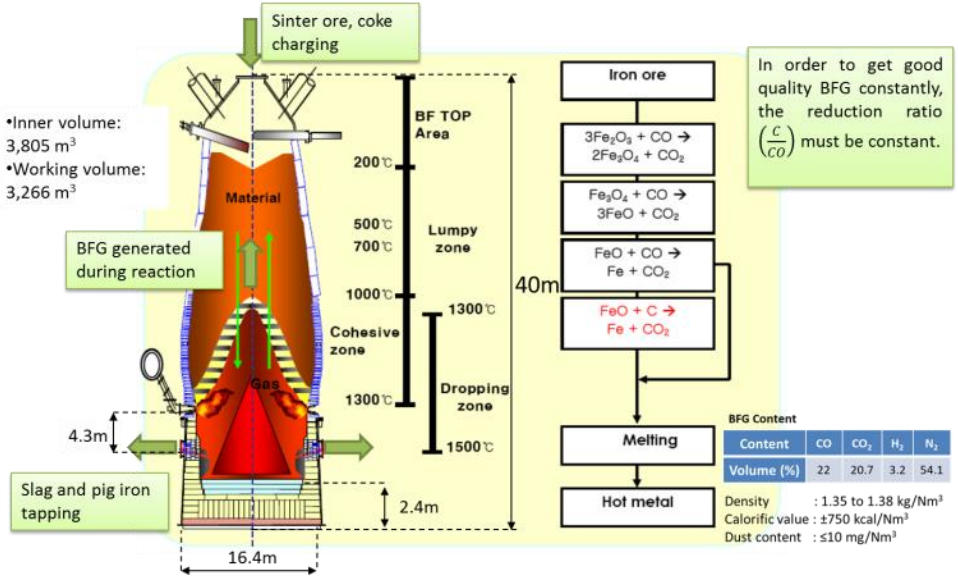
ISM PTKP during the production process generating a lot of energy recovery such as usable heat, electricity and fuel through a variety of processes. Energy recovery that utilized by PTKP are such as fuel **(BFG, COG & LDG), electricity and steam**. Total energy recovery about **30%** from energy purchasing.



Blast Furnace Gas (BFG)

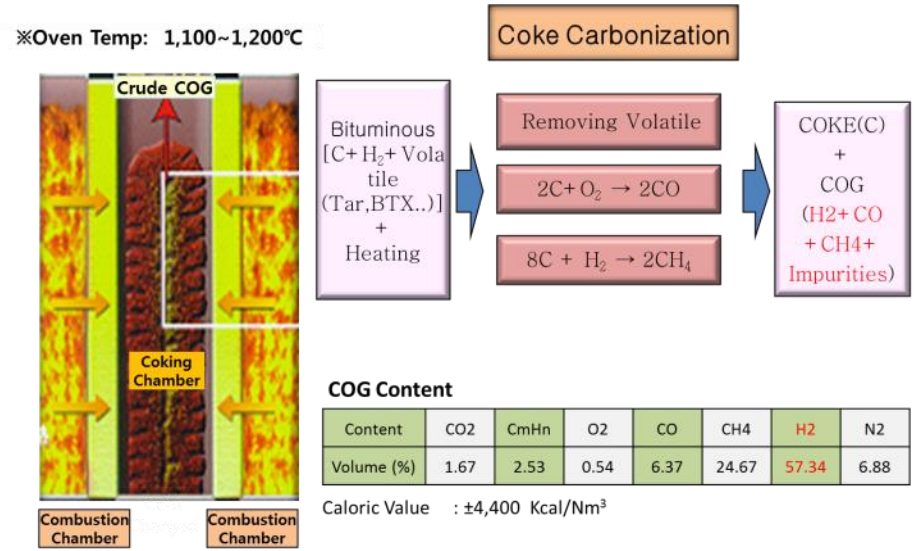
- BFG or Blast Furnace Gas is Off Gas that produced from the **combustion between Hot Blast-pulverized coal-coke,** and also from **reduction process of iron ore** inside the Blast Furnace.



- Annual BFG production up to **0.38 MTOE (25% of energy consumption).** BFG use as fuel for ISM operation as much **46%** for Blast furnace and Coke Oven Plant. Then as fuel for Steam Power Plant **50%** (export energy).

Coke Oven Gas (COG)

- Raw COG is generated during **coking coal carbonization process** which taking place in oxygen-less ovens of Coke Oven Plant (COP). The raw COG is further processed in the Gas Treatment Plant to remove ammonia liquor, tar, and light oil prior to utilization as fuel. From that process there are energy recovery generated beside clean COG, such as TAR and BTX which be sold to as much **0.04 MTOE**.



COG Content

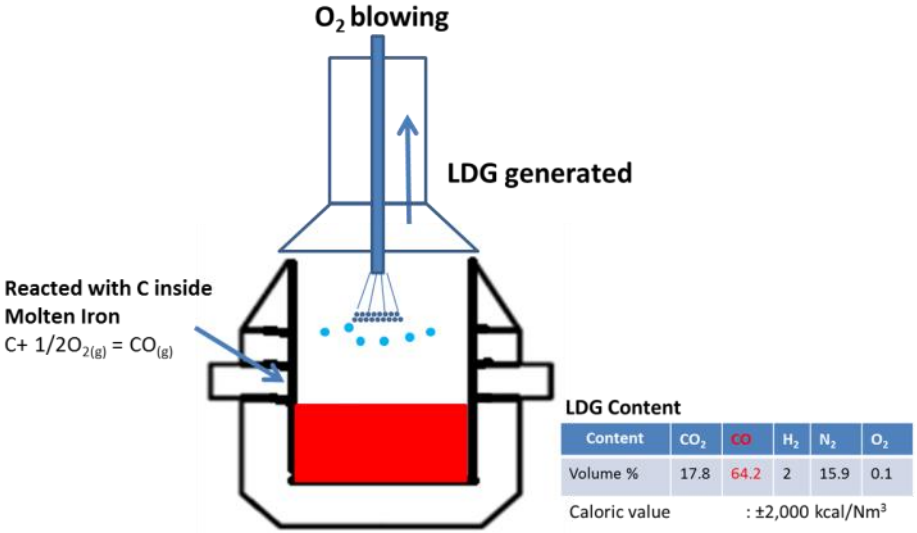
Content	CO2	CmHn	O2	CO	CH4	H2	N2
Volume (%)	1.67	2.53	0.54	6.37	24.67	57.34	6.88

Caloric Value : ±4,400 Kcal/Nm³

- Annual COG production up to **0.22 MTOE (15% of energy consumption).** COG use as fuel for ISM operation as much **64%** for Sinter, Blast furnace, Coke Oven and Plate Plant. Then **36%** as fuel (export energy) for Steam Power Plant 28% and 8% for other outsourcing companies.

LDG (Linz Donawitz Gas)

- Linz Donawitz Gas is the gas that produces from the **oxidation process of molten iron** (C contain 4~4.5%) into melted steel (C Contain 0.04%) in a Basic Oxygen Furnace (BOF). LDG composition is mainly from Carbon Monoxide gas, the reaction: C + ½ O2 = CO (gas).



LDG Content

Content	CO_2	CO	H_2	N_2	O_2
Volume %	17.8	64.2	2	15.9	0.1
Caloric value	: ±2,000 kcal/Nm³				

- Annual LDG production up **to 0.04 MTOE (3% of energy consumption).** LDG use as fuel **100%** for Steam Power Plant (export energy).

Top Pressure Recovery Turbine (TRT)

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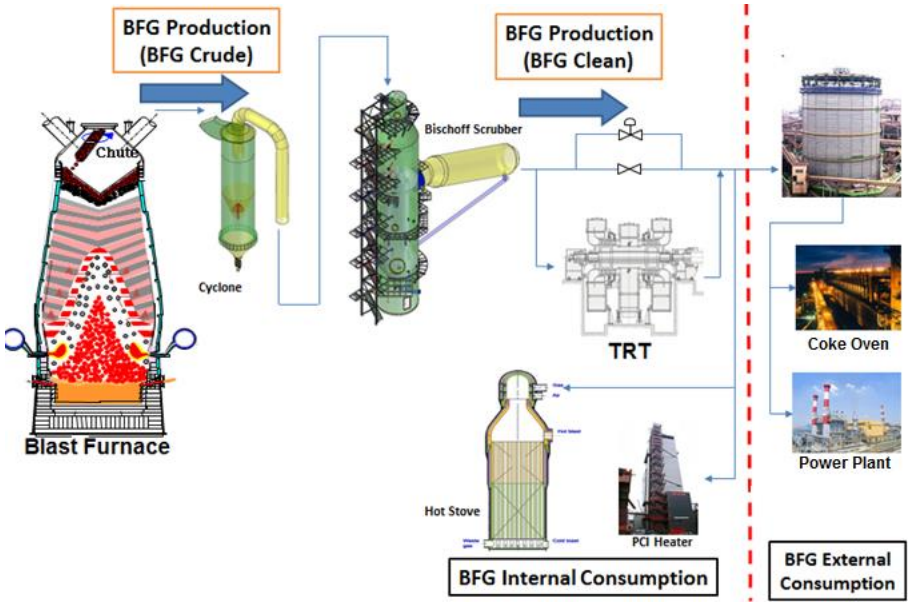
- TRT can generate electricity during the blast furnace process by utilizing pressure gas out of top blast furnace (BFG) to rotate a turbine-generator. Top gas pressure inlet is approximately **0.95 kg/cm²** and outlet **0.1 kg/cm²**. The average annual electricity production is **14 MW**.



- With installation TRT in Blast Furnace, ISM PTKP can generate electricity and can annually **save 0.03 MTOE (2% of energy consumption).**

Waste Heat Boiler

Steam is produce from circulating the de-mineralized water into cooling stack to cooling the Linz Donawitz Gas (LDG). This is the system that produces high-pressure process steam by using waste gas generating from converter in Steel Making Plant (SMP).

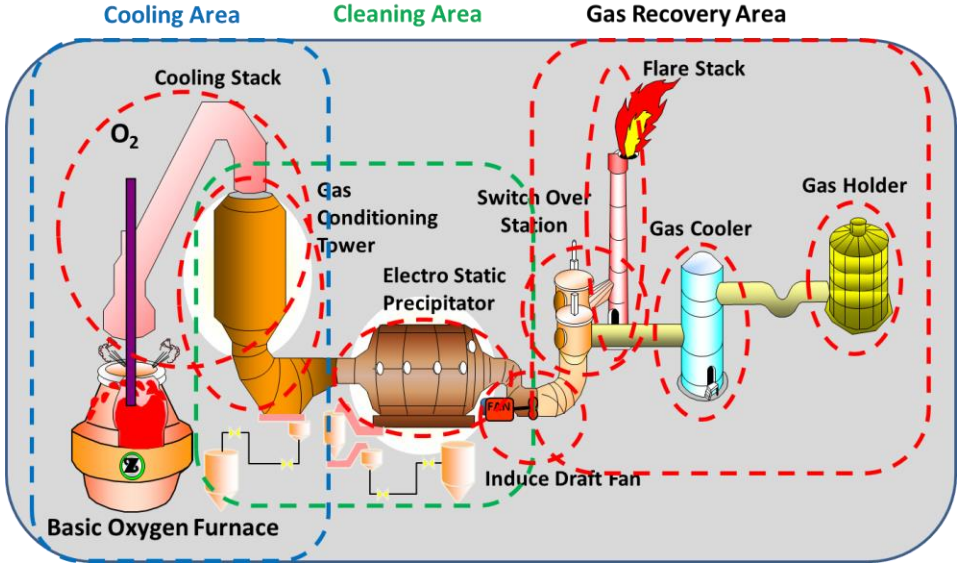


Table Temperature Each LDG Treatment Facility

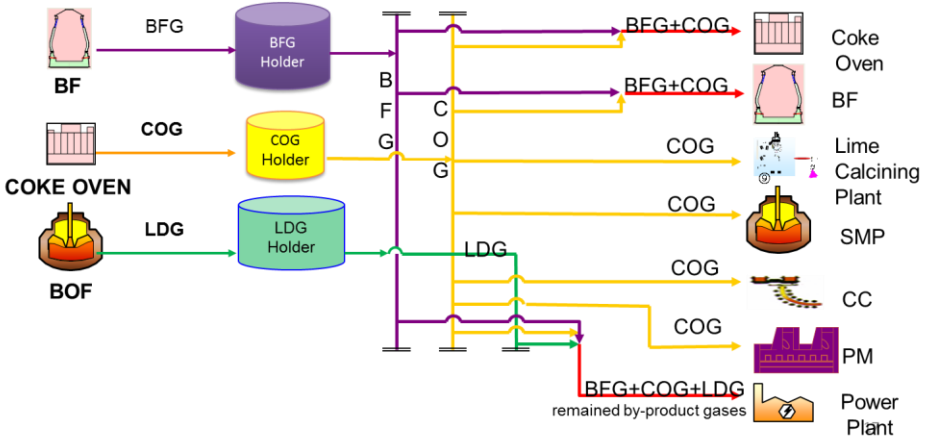
	T (°C)
BOF	1,700
CS	**1,000**
EC	200
ESP	170
ID Fan	170
GC	70

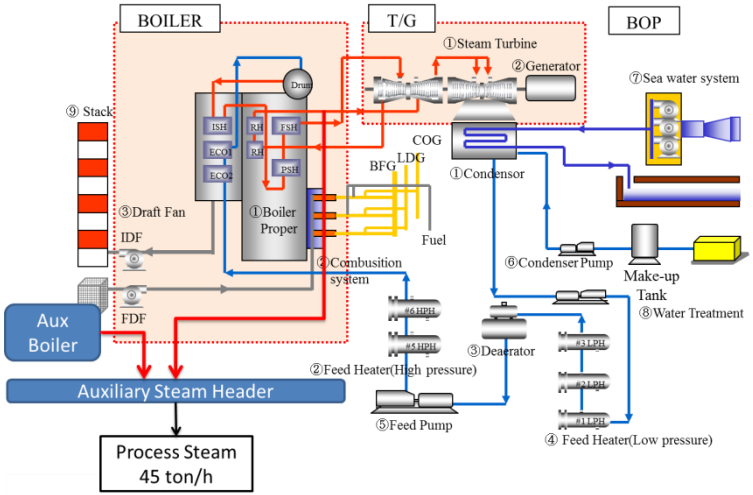
- By Utilize heat LDG in steel making plant can reduce energy consumption up to 0.005 MTOE per year (0.3% of energy consumption).

Steam Power Plant

- In order to **maximize utilization of by-product gas** that generated by our ISM, PTKP conduct such a work collaboration with other investment to build a Steam Power Plant.

- Steam Power Plant has **capacity 2 x 100 MW** with main fuel by-product gas consist of BFG, COG and LDG which supplied by ISM PTKP





- About **0.29 MTOE** of the surplus by-product gas came from ISM PTKP are recovered and utilized as fuel of the gas-fire boiler. Therefore about **138 MW** of electricity and **45 ton/hr** of steam that generated and supply to ISM PTKP

Renewable Energy & Green Steel Industry Road Map

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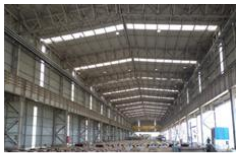
2022-2023

- Solar Panel Installation for the pilot project of renewable Energy on 2023

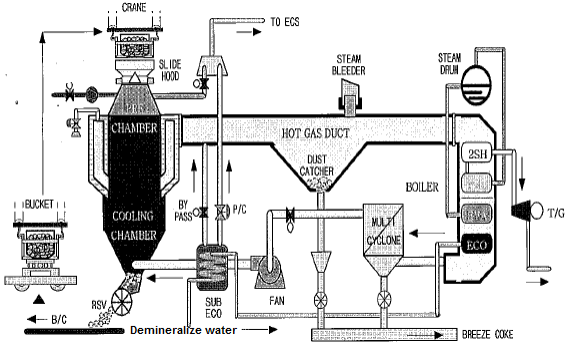


HSM#2 Coil Yard Length and Width (204 m x 22.4 m)

Rooftop Solar Power Plant

2025-2026

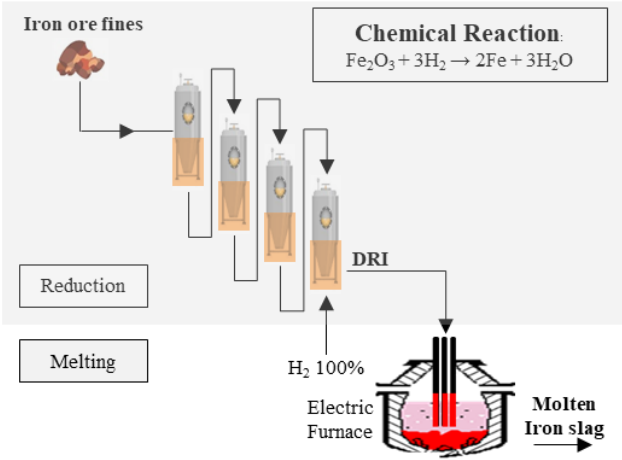
- Feasibility study for investment facility to utilize energy recovery such as, new Waste Heat Boiler, CDQ, Steam Power Plant to reduce energy usage of 2nd phase



2030

- POSCO Eco-Friendly Technology Application (Hydrogen Reduction) for the 3rd phase on 2030 with capacity 3 million tons of crude steel

Fluidized Bed Reduction Reactor (HyREX)



Conclussion

- In terms of PTKP as an integrated steel mill as emphasizes to use energy in the most efficient, cost-effective and environmentally responsible manner possible. **PTKP will keep on efforts of energy reduction improvement**. Several activities is conducted such as energy supply & demand management, implementing high innovative technique to utilizing energy recovery and continuous improvement activities.

- These efforts reduce the energy consumption as much as **0.72 MTOE or equal 48% of energy consumption per year**. Its consist of **43% from utilizing by-product gas as fuel** for ISM PTKP operation and export energy, by **selling BTX and TAR 3%.** Then the remaining **2% from Top Pressure Recovery Turbine electricity generation and steam recovery of waste heat boiler**.

KEMENTERIAN ENERGI DAN SUMBER DAYA MINERAL

DIREKTORAT JENDERAL ENERGI BARU, TERBARUKAN, DAN KONSERVASI ENERGI

NO. 0198/IND/DEK/2021

TERIMA KASIH KEPADA

PT. Krakatau Posco

Jl. Afrika No.2, Cilegon, Banten 42443, Ciwandan, Cilegon, Banten

Atas Laporan dan Komitmen dalam penerapan manajemen energi sesuai dengan Peraturan Pemerintah Nomor 70 Tahun 2009 tentang Konservasi Energi

PERIODE PELAPORAN TAHUN 2021

POIN - POIN PELAKSANAAN MANAJEMEN ENERGI:

1. Menunjuk manager energi bersertifikat
2. Menyusun program konservasi energi
3. Melaksanakan audit energi secara berkala oleh auditor bersertifikat
4. Melaksanakan hasil audit energi
5. Melaporkan pelaksanaan konservasi energi kepada pemerintah setiap tahun

KONTRIBUSI PENGHEMATAN ENERGI:

147.173,00 GJoule


Terima Kasih
KRAKATAU posco
Cilegon Works