

Thailand Presentation

“Waste Heat Recovery: Thai Cement Experience”

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The 25th AFCM Technical Symposium & Exhibition
The Trans Luxury Hotel, Bandung, Indonesia
April 6, 2018

About Thai Cement Manufacturers Association (TCMA)

❖ Cement manufacturer-led, Thai leading cement manufacturers coalition advocating for cement industry being:-



Leading Towards Sustainable Development



Becoming Environmental Friendly Industry

Basic Infrastructure of the Country Development



Committed to Social Responsibilities Engagement



About Thai Cement Manufacturers Association (TCMA)

❖ REGISTERED with Ministry of Commerce, Thailand on May 8, 2006.

❖ MEMBERS:



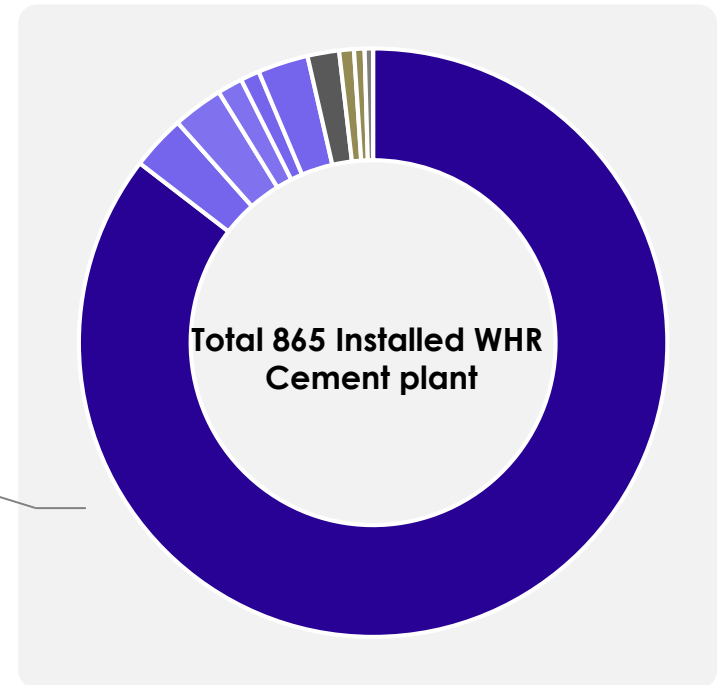
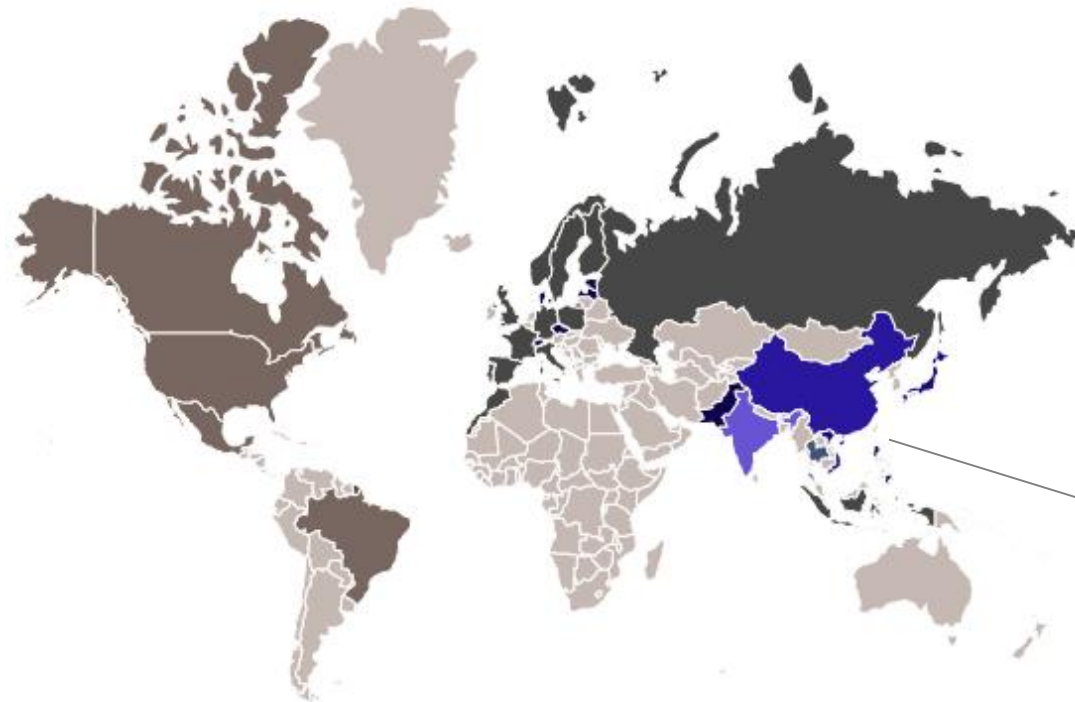
❖ MISSIONS:

- ✓ a coordinating office of Thai cement manufacturers,
- ✓ providing a platform for companies to share experiences and best practices on cement issues i.e. mining-natural resources, technical, product standard, occupational-health-safety, environment, etc. and advocate for their implementation,
- ✓ working with government agencies as well as non-government organizations at national and international levels.

TCMA is a member of ASEAN Federation of Cement Manufacturers (AFCM)

“Waste Heat Recovery: Thai Cement Experience”

There are over 850 WHR power installations in the world. China leads in the number of WHR installations—739, followed by India (26 WHR installations) and Japan (24 installations)



- China (739)
- India (26)
- Japan (24)
- Thailand (12)
- Pakistan (9)
- Other Asia (24)
- Mid East (15)
- Europe (7)
- Americas (5)
- Rest of World (4)

Source: "Latest Waste Heat Utilization Trends" OneStone Research; CemPower 2013

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14 WHRs installation in Thailand Y2018, Capacity 270.1 MW



Waste heat generation installed 270 MW
Substitute Electrical energy consumption more than 20%

Company name	No. of installed WHR plant	WHR Production Capacity (MW)
Siam Cement	5	122
Siam City Cement	4	52.5
TPI Polene	3	70
Asia Cement	1	21.1
Thai Pride Cement	1	4.5
Total	14	270.1

ACC & JCC at a glance



บริษัท ชลประทานซีเมนต์ จำกัด (มหาชน)
Jalapraphan Cement
Public Company Limited



บริษัท ปูนซีเมนต์เอเชีย จำกัด (มหาชน)
Asia Cement
Public Company Limited



Thailand's 4th largest cement producer

Over 28 years of presence in cement business for ACC and 62 years for JCC



3 Production facilities
(Pukrang, Takli and Cha-am plants)



Total cement production capacity
of 7.3 million tons

All cement plants are ISO 9001, ISO 14001 certified.

Commissioned Waste Heat Recovery Project
in June 2013



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Introduction: I would like to first present you a short movie describing our WHR system visually, then we will go into some process details to better understand how the system works...

: Play the 5 min. movie file!!

GENERATING GREEN ENERGY IN THAILAND



In June 2013, Asia Cement PLC, took a major step towards green energy production by the commissioning of a **21.1 MWe** capacity Waste Heat Recovery (WHR) and Power Generation (PG) plant within Pukrang Plant.

PROJECT HIGHLIGHTS

Budget

1,220 Million THB (35 M\$)

Project duration

18 months

Engineering, Supply & Supervision

Anhui Conch Kawasaki Engineering Co., Ltd. (ACK)

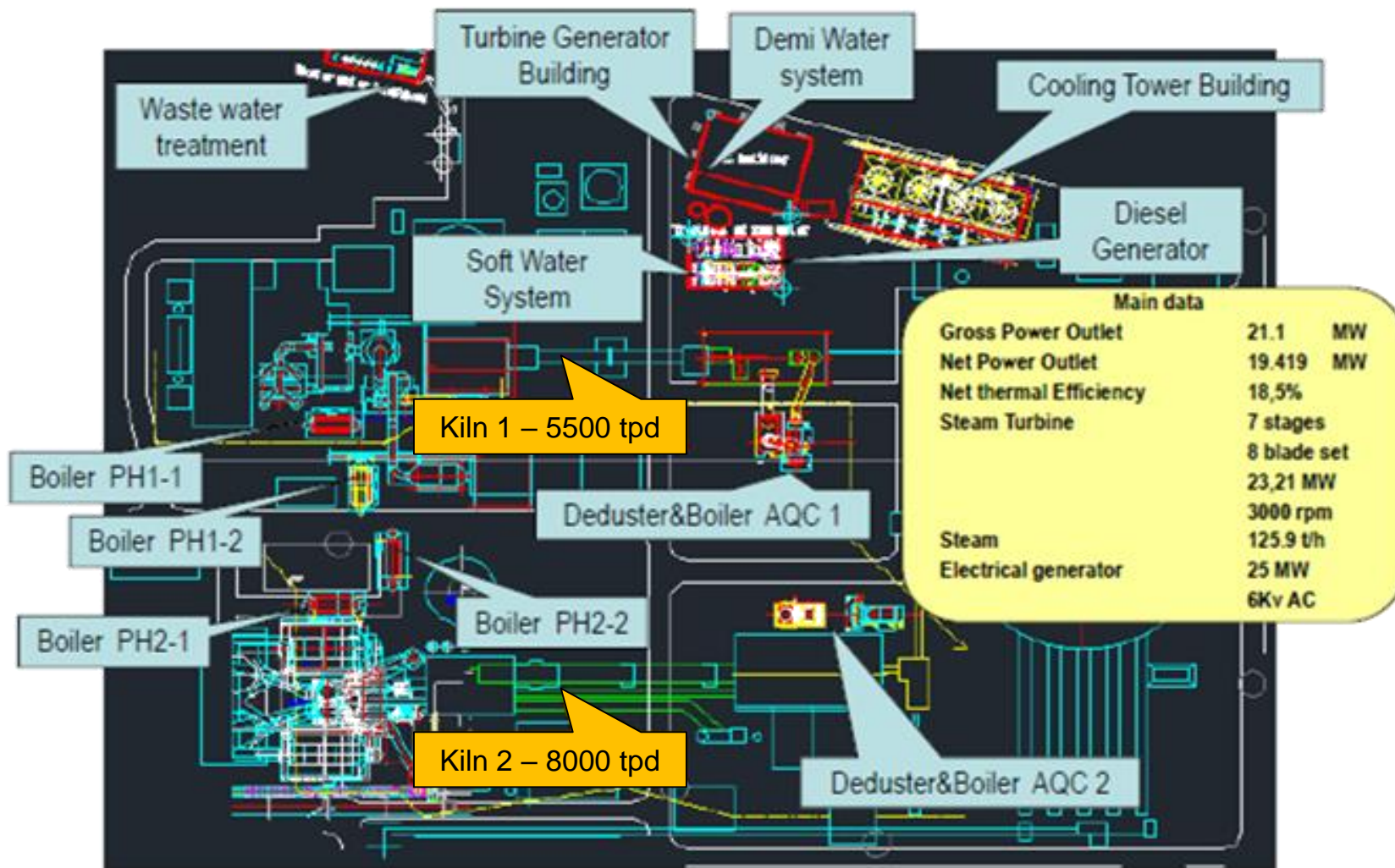
Construction Company

R.K. Union Construction Co., Ltd.

Quantities of building materials used for the project

- Piles: 1,150pc.
- Concrete: 10,000m³
- Rebar: 1,100 tons
- Steel structures, duct works: 6,400 tons

Plant Lay-Out



CONSTRUCTION PHASE

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Foundation Works



T/G Building



Cooling Tower



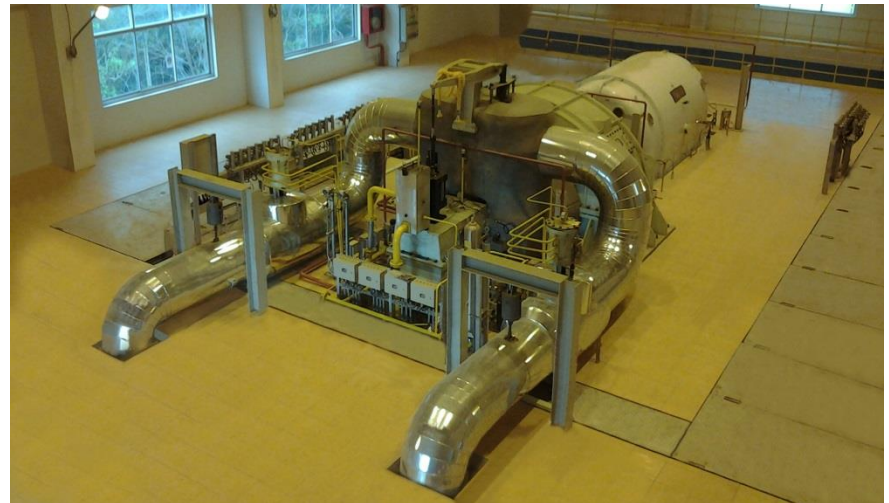
AQC Boilers



PH Boilers



Steam TG Installation



Commission: June 2013



Gross Power output:

21.1 MWe

Net Power output:

19.4 MWe

**Electricity self
consumption:**

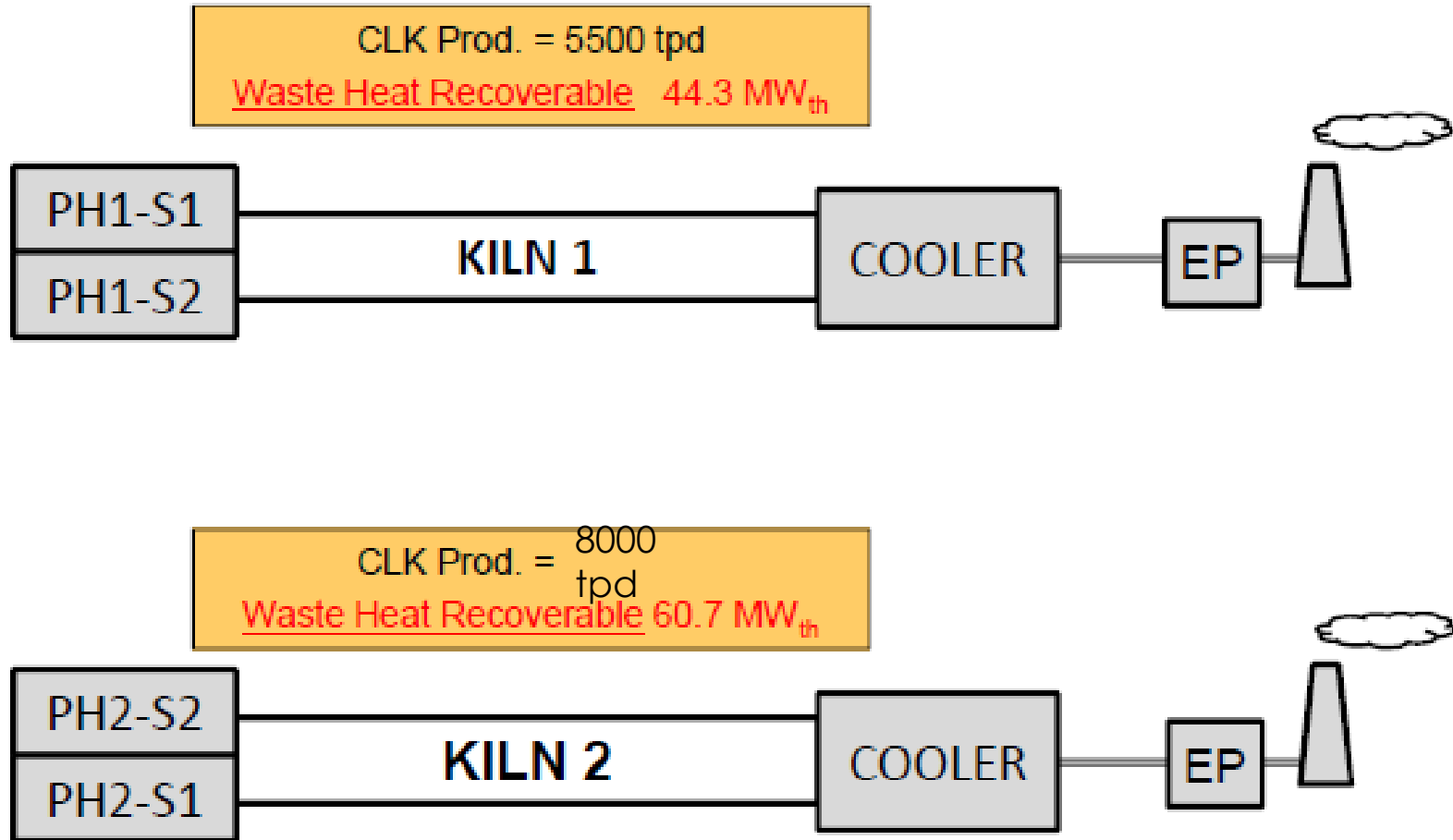
8% approx.

**Total raw water
consumption:**

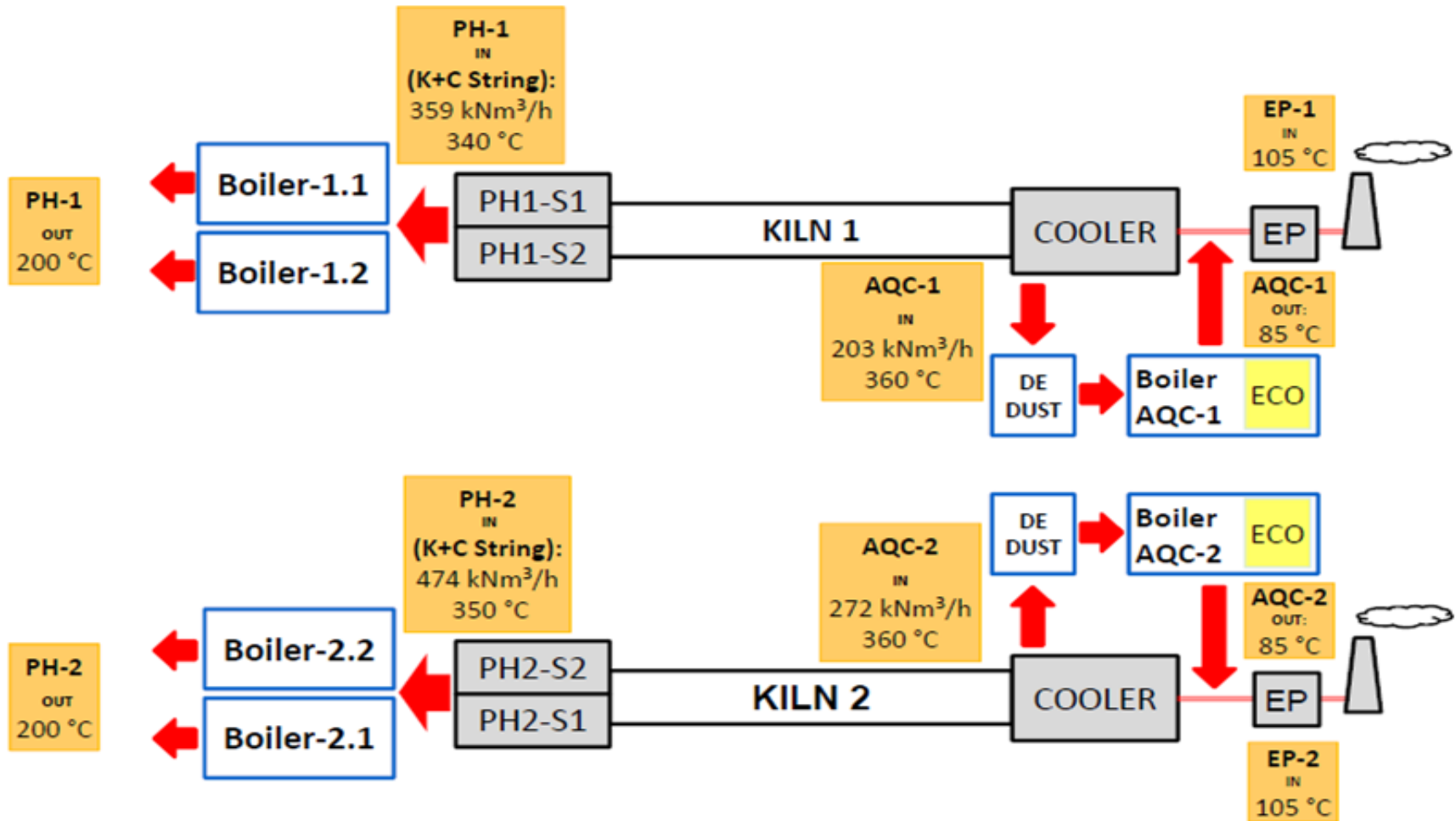
4,200 m³/day approx.

WHR PROCESS CONFIGURATION

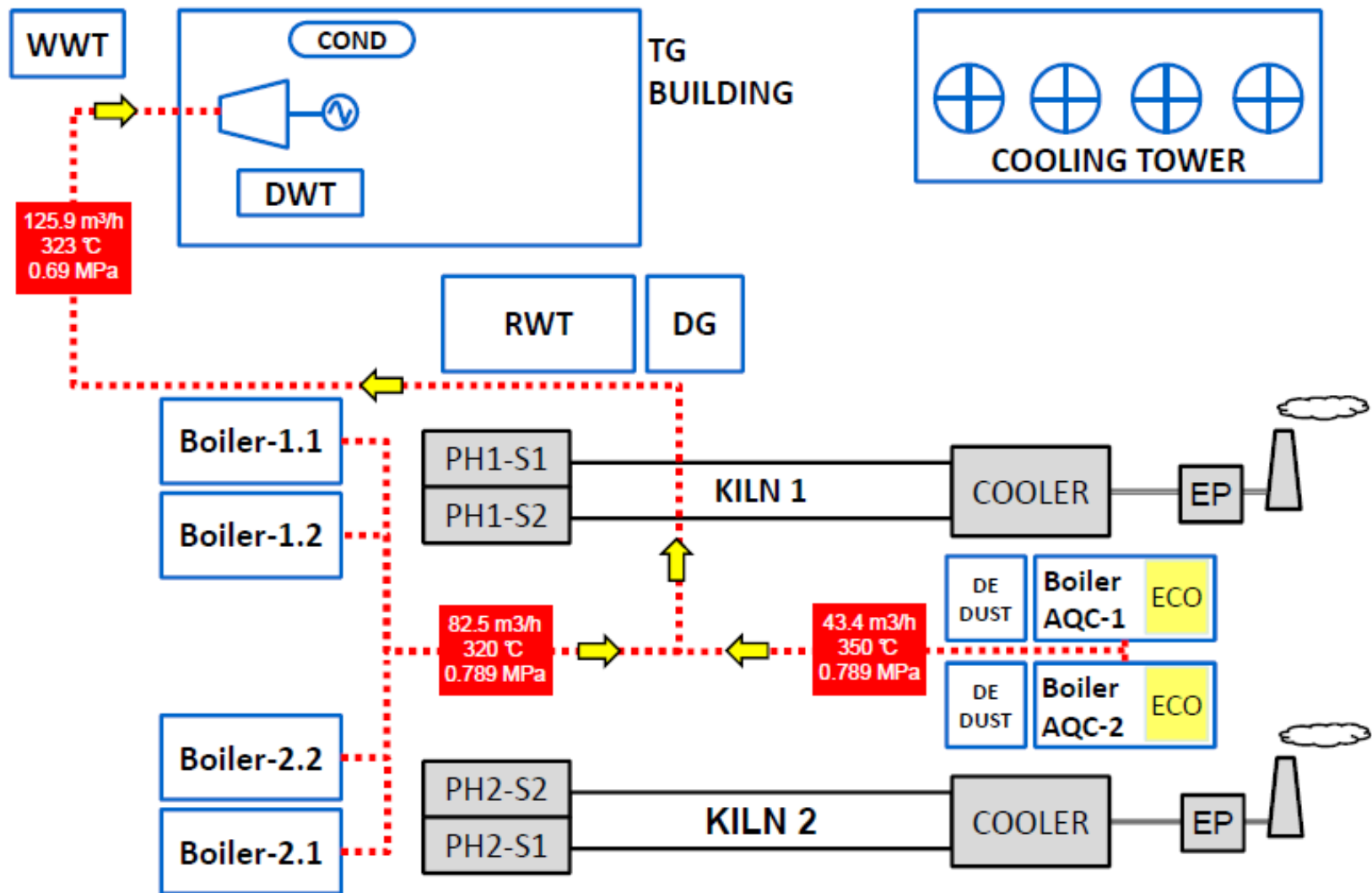
Burning Line Configuration



Hot Gas Flows



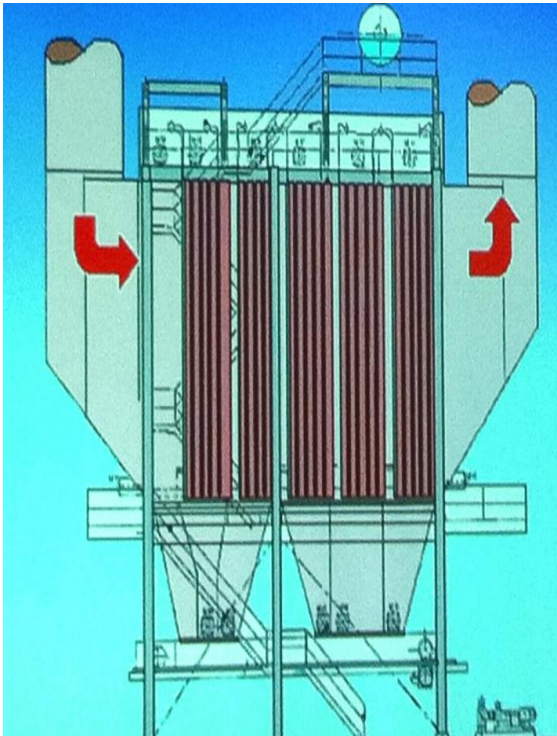
High Pressure Steam System



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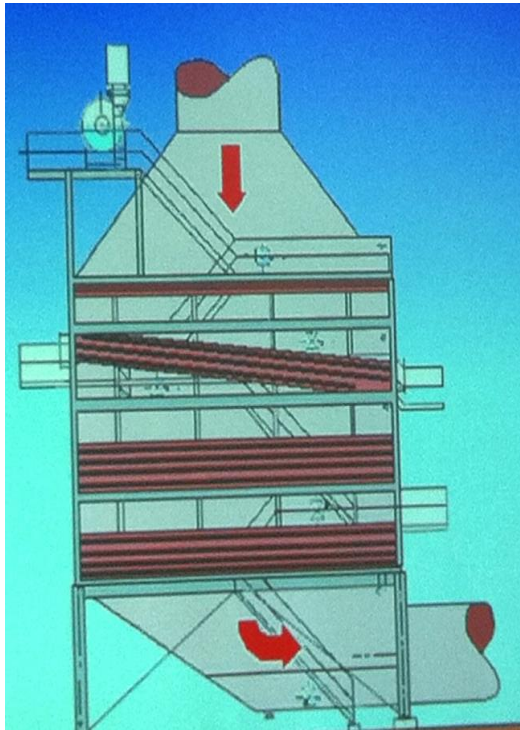
PH Boilers

The system is recovering the waste heat from two cement kiln lines, using Steam Rankine Cycle (SRC) utilizing the demineralized water as working fluid and involves generating steam in two different types of waste heat recovery boilers (WHRB), first is Horizontal Type two boilers connected in parallel to the suspension preheater downcomer of each Kiln (**PH boilers**)



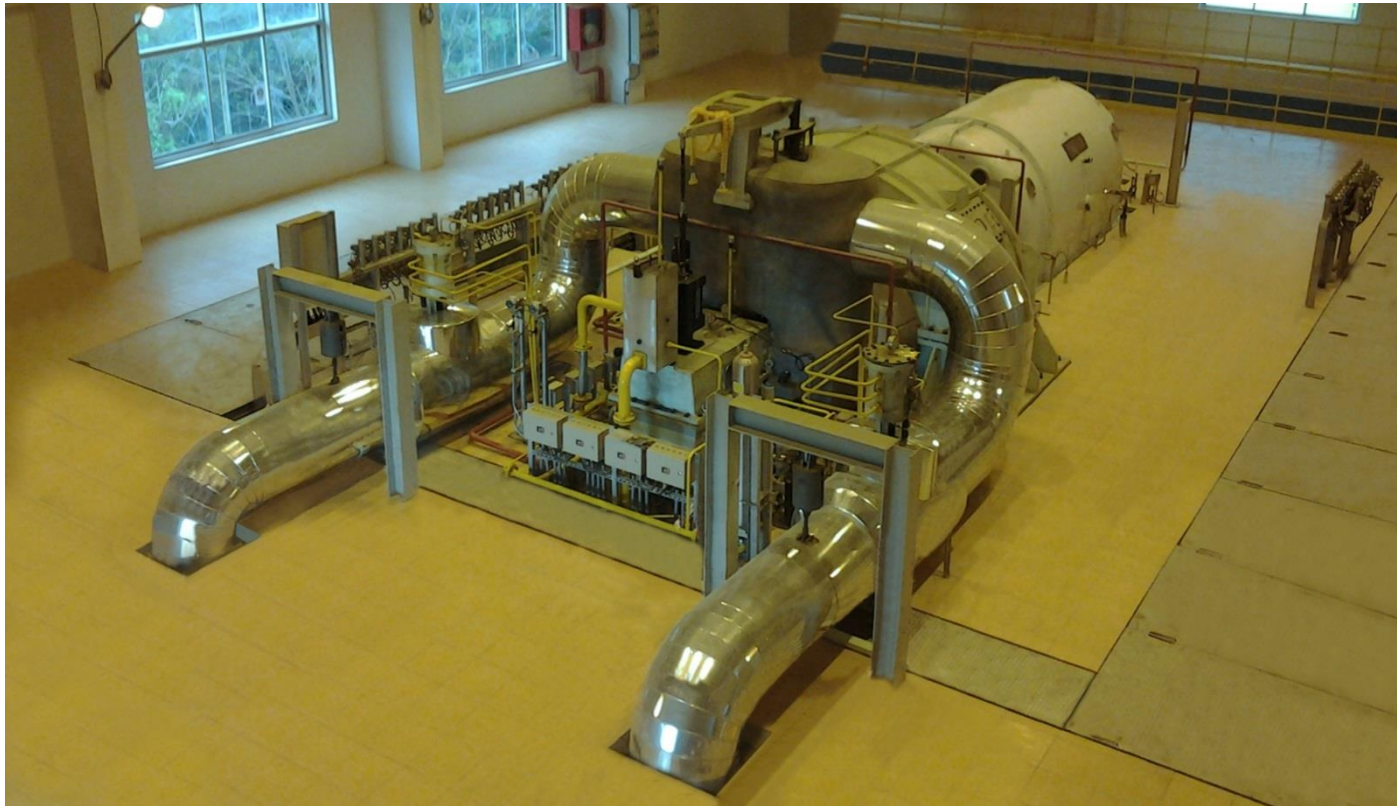
AQC Boilers

The second is Vertical Type boiler connected to the clinker cooler of each Kiln (**AQC boilers**). In the boilers the water is vaporized into pressurized steam by the hot exhaust gases from the process, the system is designed to produce 126 t/h of steam from the 6 boilers at a pressure of 8 bars and a temperature of 323 °C.



Steam Turbine

The steam expands into the **steam turbine** of a multi-stage, condensing single cylinder. The system is also equipped with a low pressure flusher producing saturated steam (1.3 bars) enters the secondary steam turbine.



Condenser

The steam then expands up to the condensation pressure of 0.1 bar into the water cooled surface condenser in which circulating water from the cooling towers condenses the turbine-exhausted steam then the condensate is transferred by a water feeding pump to the WHRBs, where the cycle repeats itself.



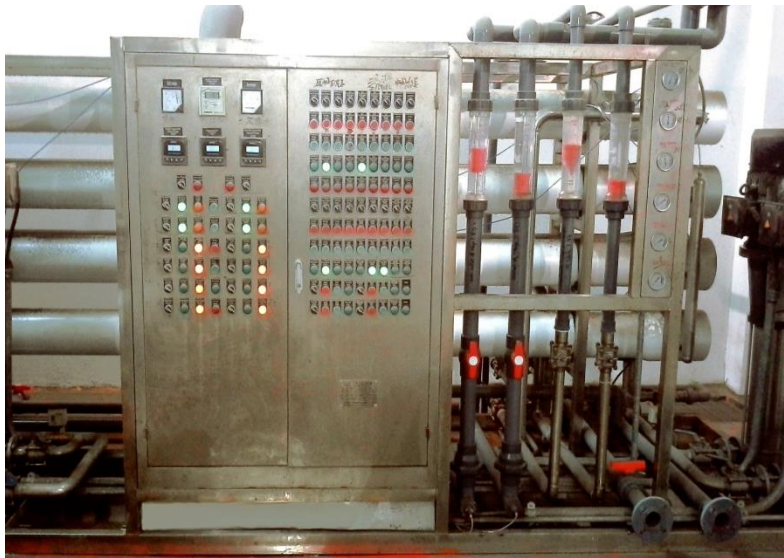
Cooling Tower

The system daily consumption of raw water is 4,200 m³/day mostly due to evaporation of the cooling water at the conditioning **cooling tower** & some minor quantity of the demineralizing make-up water for the steam production.



Water Treatment

The system is designed to provide the required feed-water from two main sources, ground water via three deep wells and surface water via open pit basin, the **water treatment system** can be adopted to 100% from single water source or in proportion by the two sources; the raw water is treated by mechanical filtration and chemical additives for the cooling water and by **Reverse Osmosis and EDI system** for the demineralizing water.



RO (Reverse Osmosis)



EDI (Electro De-Ionization)

Electric Generator



A synchronous electrical generator converts the rotating mechanical energy of the steam turbine wheel shaft into electricity at gross designed production capacity of **21.1 MWe** & net output power of **19.4 MWe** with average self electrical consumption of 1.7 MWe.

The system is designed to work also even if only one production line is in operation.

Waste Heat Recovery Benefits

Cement Production
Waste Heat from Exhaust Gas

Power Generation
with Environment Friendly

Advantages

- ❖ **CO₂ Emission Reduction**
 - Consumption Decreasing from
 - Grid-Connected Power Plant
- ❖ **Reduces Purchased Power Consumption**
 - Saving on Production Costs
- ❖ **Green energy**
 - Improves Public Health and Environmental Quality
- ❖ **Enhances Plant Power Reliability**

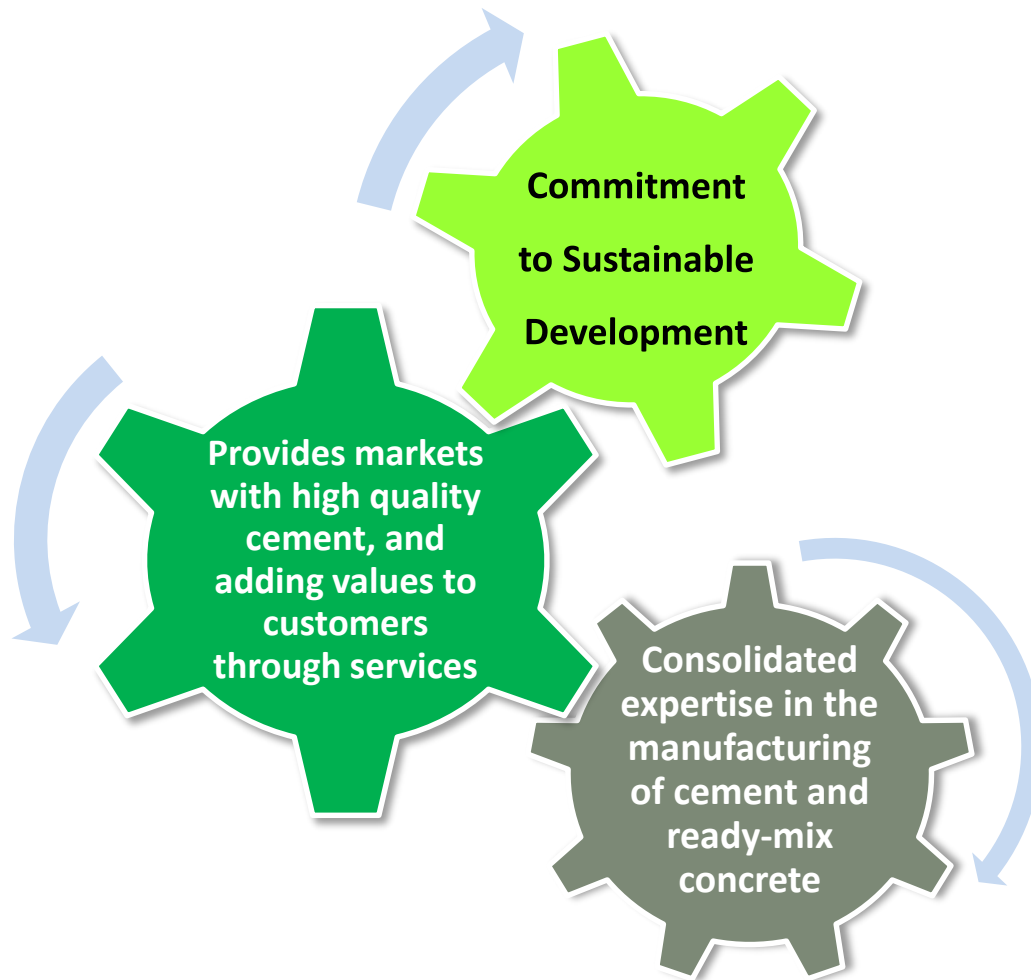




บริษัท ปูนซีเมนต์เอเชีย จำกัด (มหาชน)
Asia Cement
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Thank You



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