

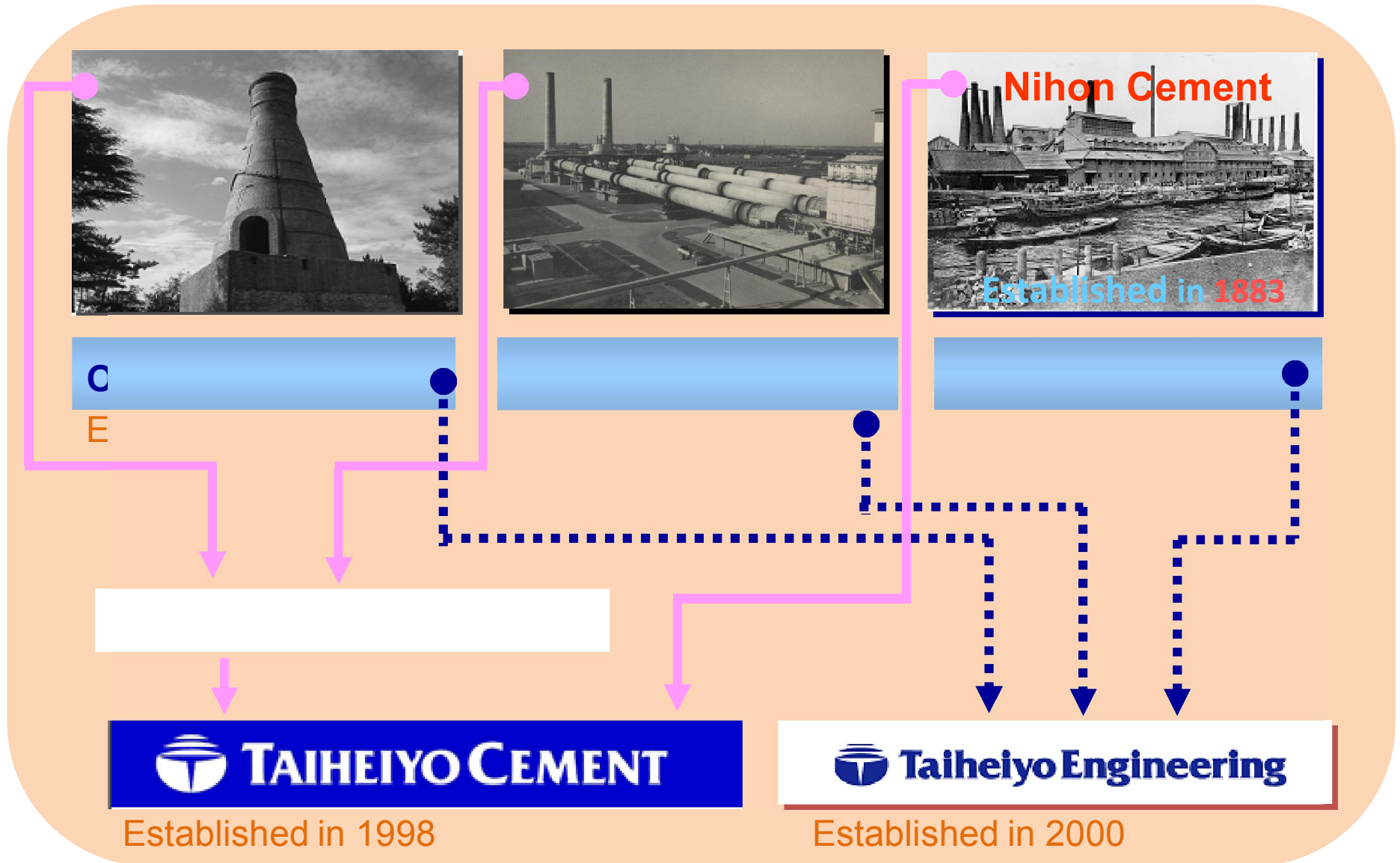
Alternative Fuel Combustion in the Cement Industry

Taiheiyo Engineering Corporation

Report contents

- 1. Introduction of our company**
- 2. Project outline**
- 3. Outline of alternative fuel equipment**
- 4. Properties of alternative fuel used and way of use**
- 5. Results of alternative fuel combustion test**

History of Taiheiyo Cement and Taiheiyo Engineering



 **Taiheiyo Engineering**

Taiheiyo Cement Plants in Japan

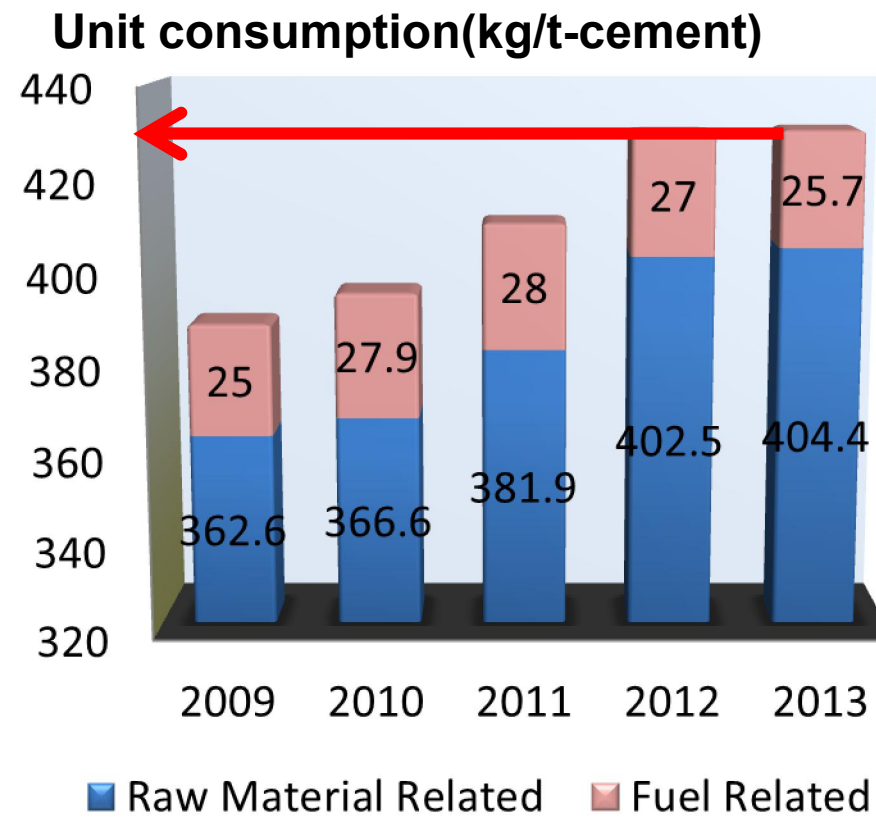
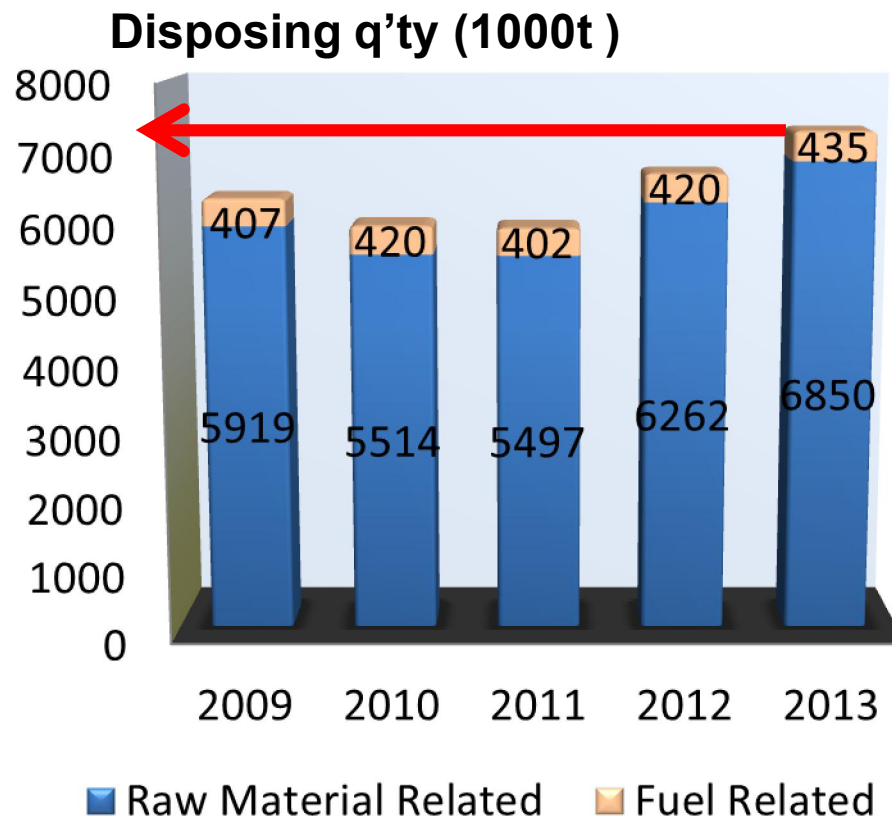
- **Taiheiyo Cement Plants**
- **Plants of affiliate companies**



Plants of Taiheiyo Cement in Pacific Rim Region

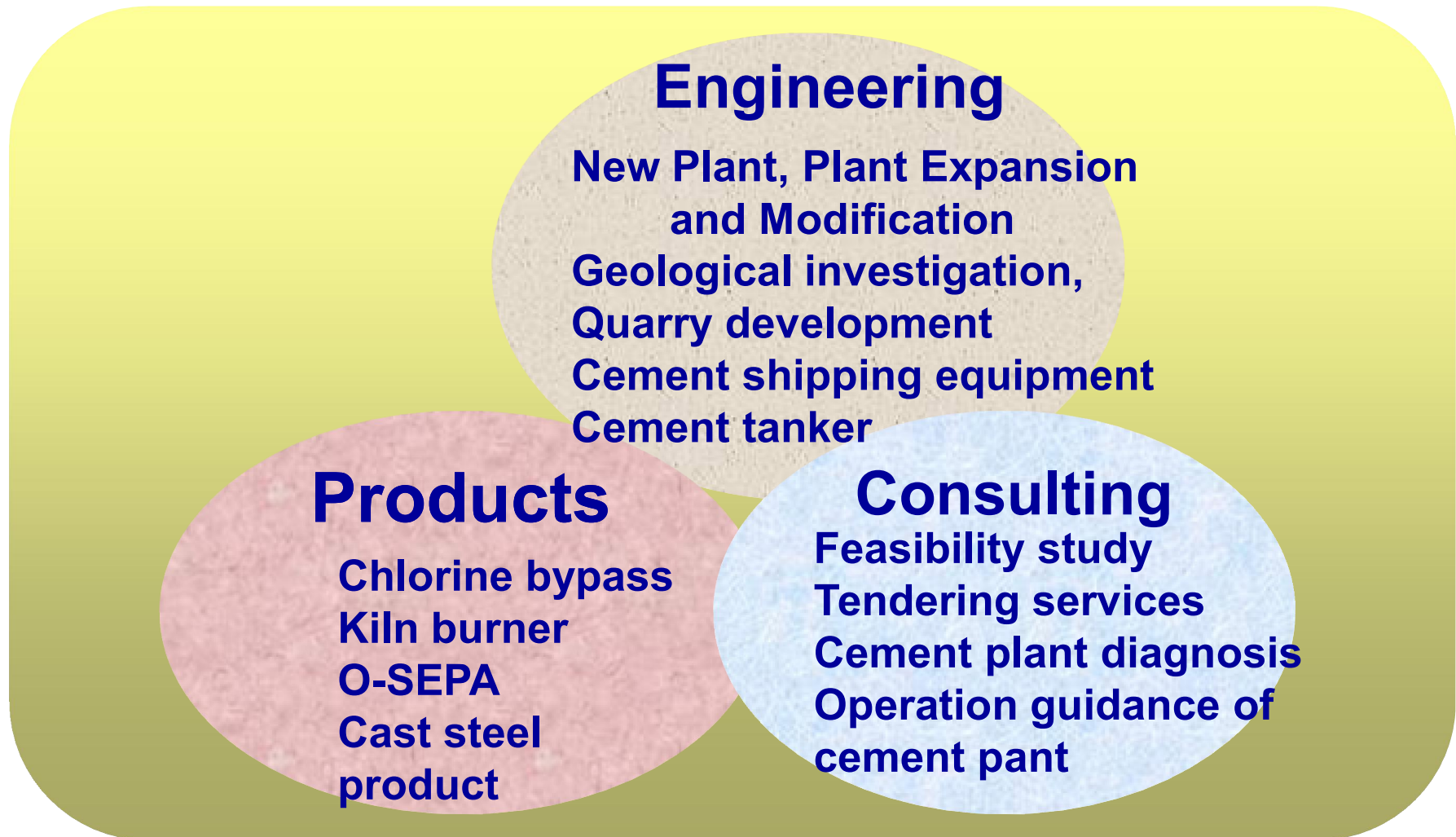


Waste material and by-product disposing condition in Taiheiyo Cement

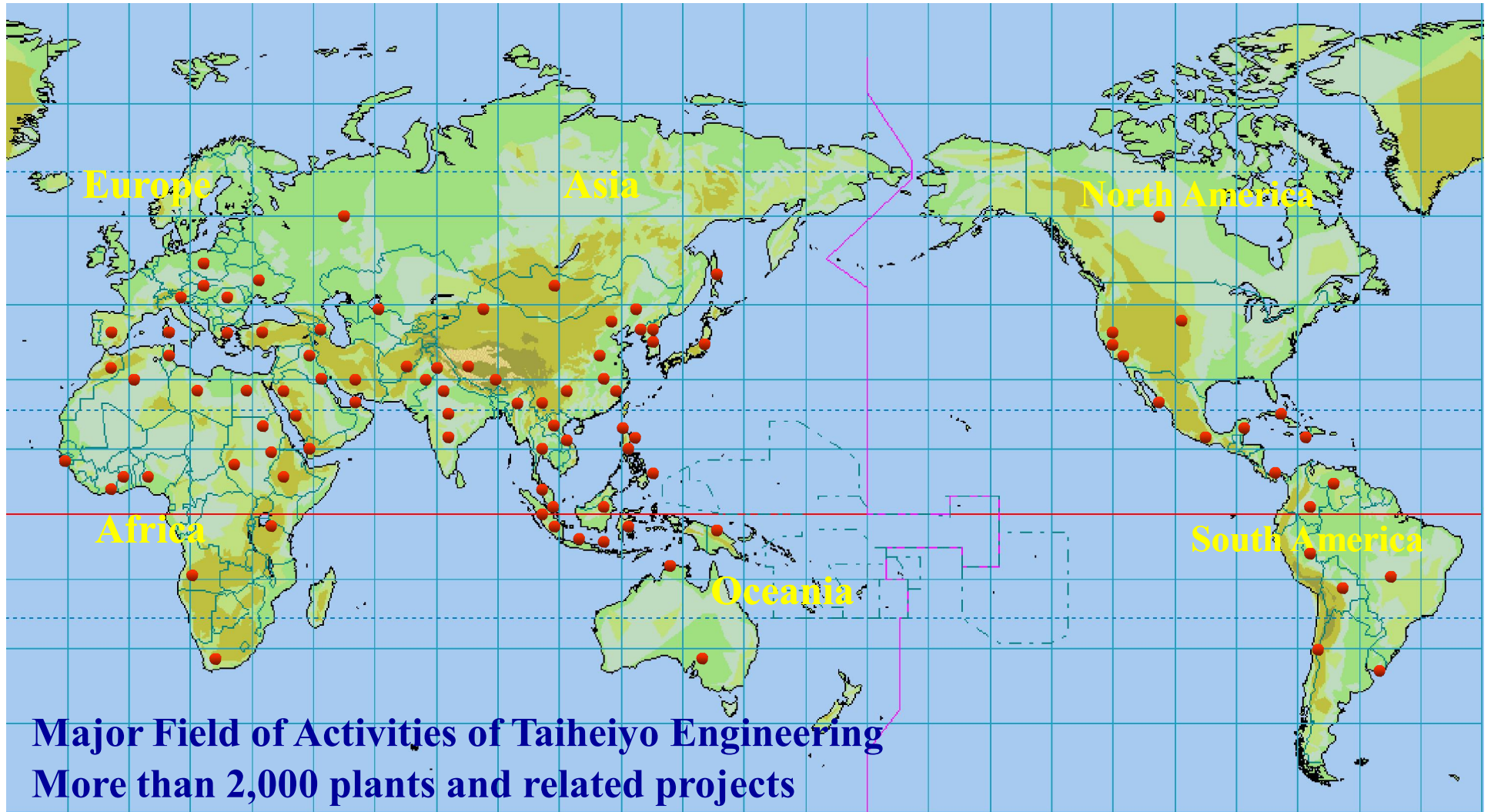


Source: Taiheiyo Cement CSR Report (2014)

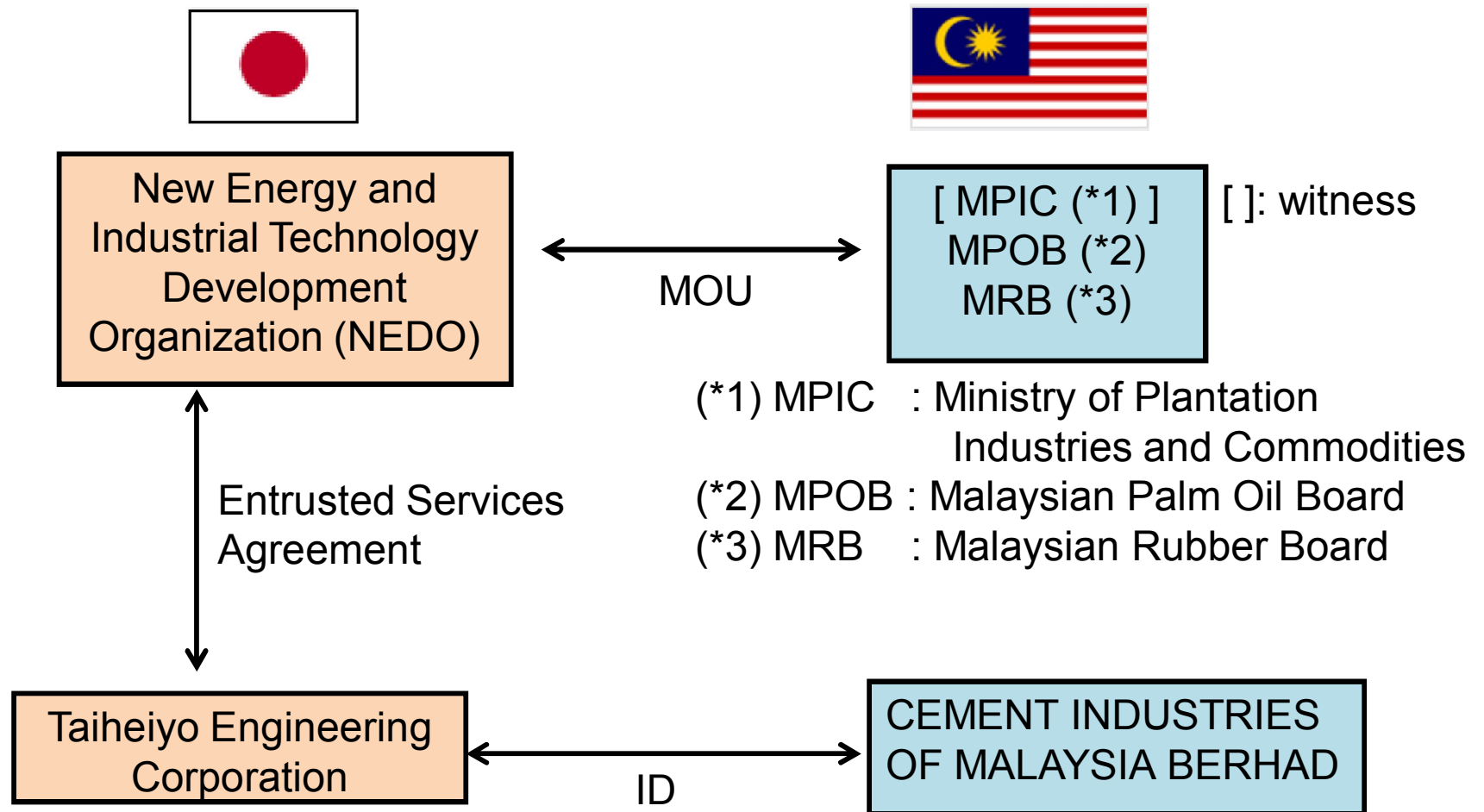
Main Business of Taiheiyo Engineering



Taiheiyo Engineering Activities in the World



Project implementation organization



Object of Project

With No.1 kiln of NSCI Bahau Plant,
to reduce coal consumption of more than 5 t/h
by utilizing biomass and combustible waste.

Map of Malaysia



Kuala Lumpur

Bahau

Source :
www.tourismmalaysia.or.jp/

No. 1 kiln, NSCI Bahau Plant

Operation start: 1998

Type of kiln : 5 Stage RSP

Clinker Production : 4,000 t/d



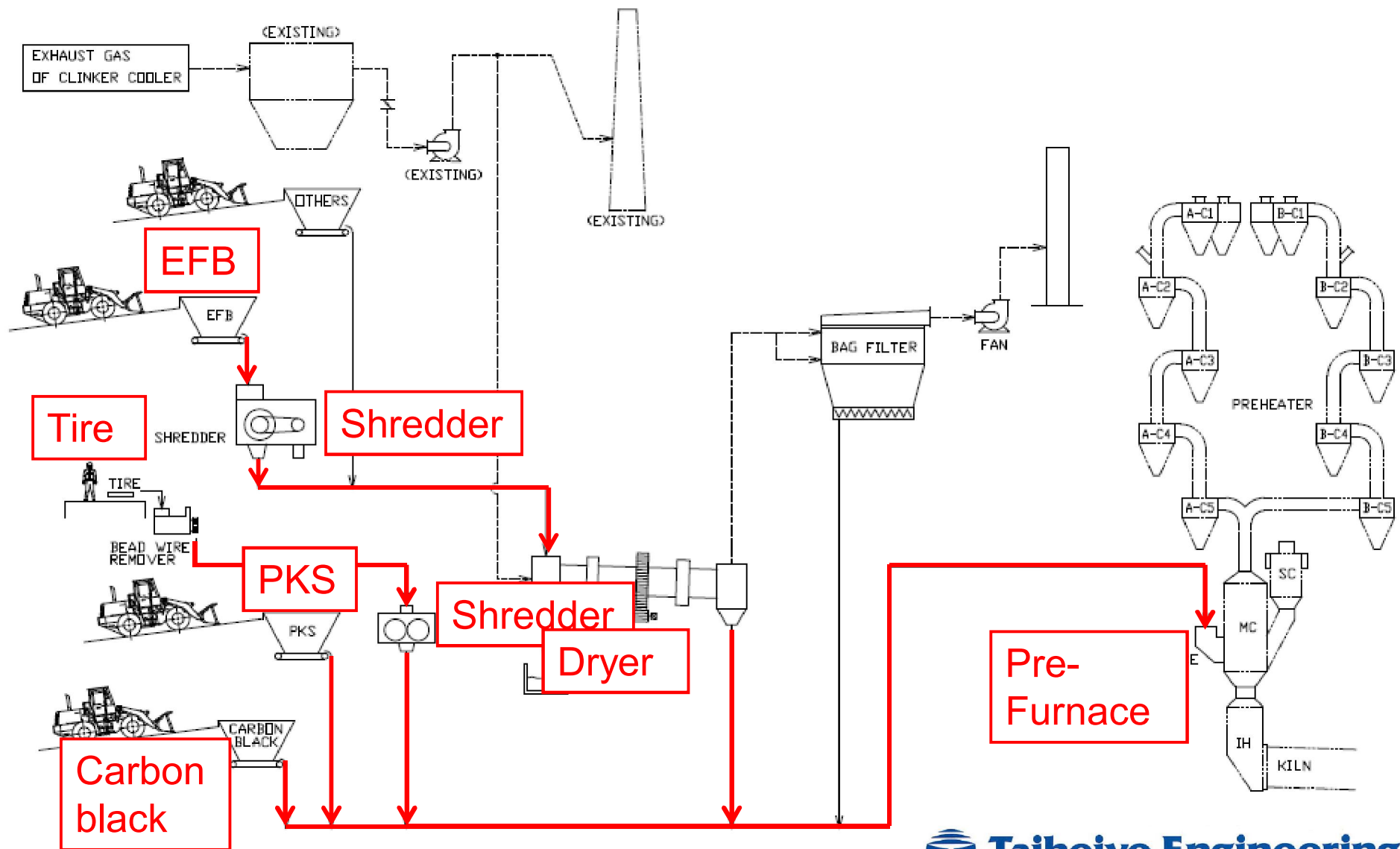
Project schedule

June 2012	ID was concluded between Taiheiyo Engineering (TEC) and CIMA.
March 2013	Foundation work was commenced.
July 2013	Installation of electrical and mechanical equipment were commenced.
December 2013	Test operation and performance test were completed.
June 2014	Alternative fuel burning test (1)
November 2014	Alternative fuel burning test (2)

Specification of main equipment

Feeder for EFB	10t/h, V=0.32-1.32m/min, 2.2kW
Shredder for EFB	10t/h, 150kW, 1-Rotor Type
Rotary Dryer	OD 3.5m/4.9m × 23.5m, 2.0-3.0rpm, 90kW
Feeder for PKS	10t/h, V=0.56-3.33m/min, 3.7kW
Feeder for Carbon Black	10t/h, V=0.18-1.06m/min, 2.2kW
Bead Wire Remover	11kW
Shredder for Tire	2t/h, 150kW, W-Rotor Type
Pre-Furnace	3.9m × 3.84m × 4.685mH, 25m ³

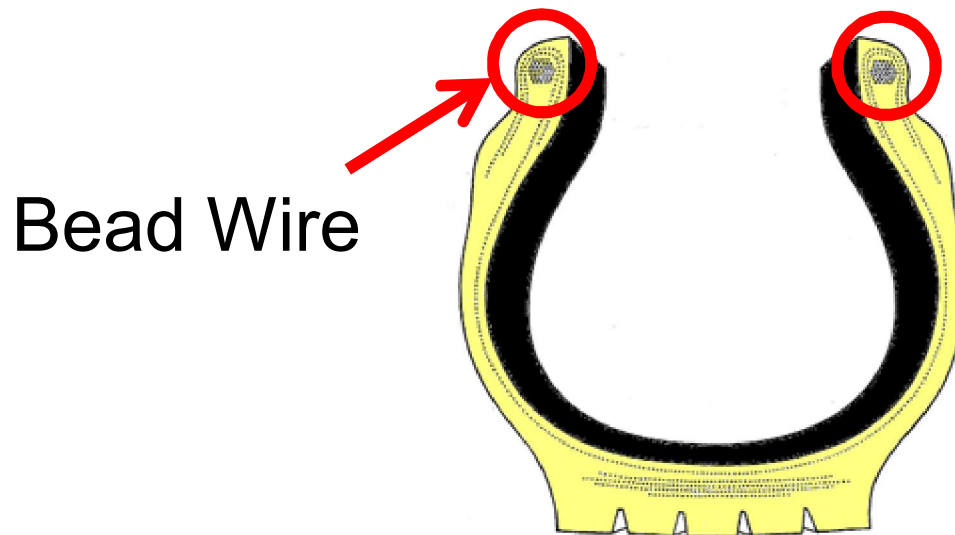
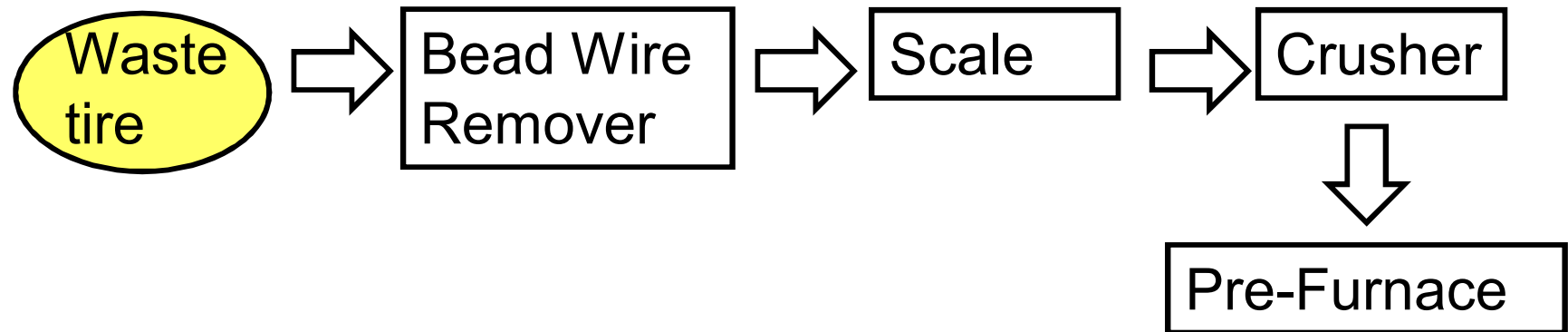
Equipment Flow



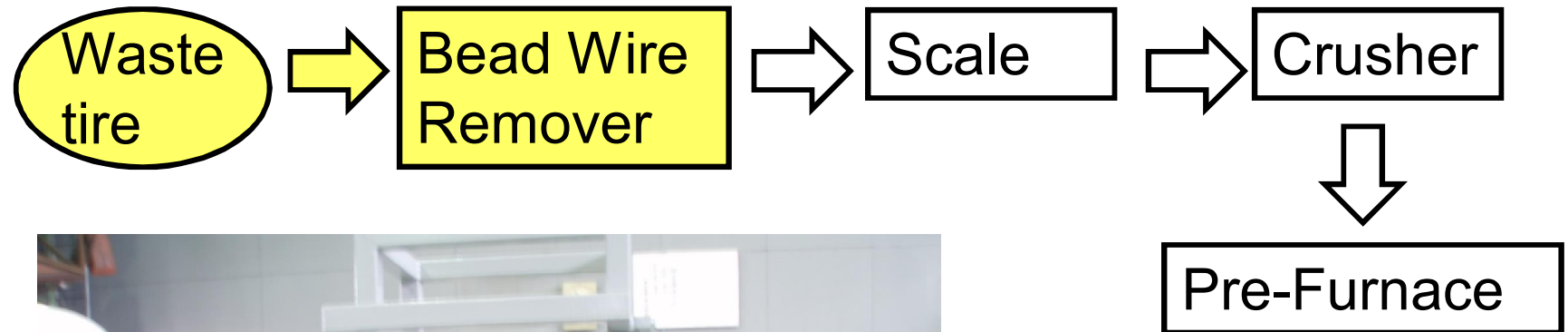
Properties of alternative fuel used for the test

Alternative fuel	Heat value (kJ/kg) (Gross, Air dry basis)	Moisture at receipt (%)
Waste tire	33,490	0
EFB	16,540	10 - 50
PKS	17,500	10 - 20
Carbon black	31,870	6 - 7

Using method of waste tire

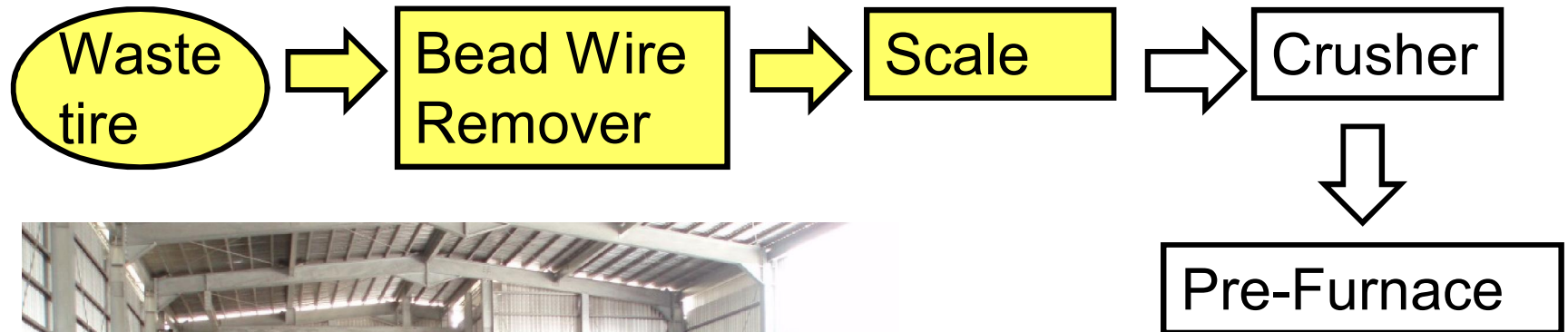


Using method of waste tire



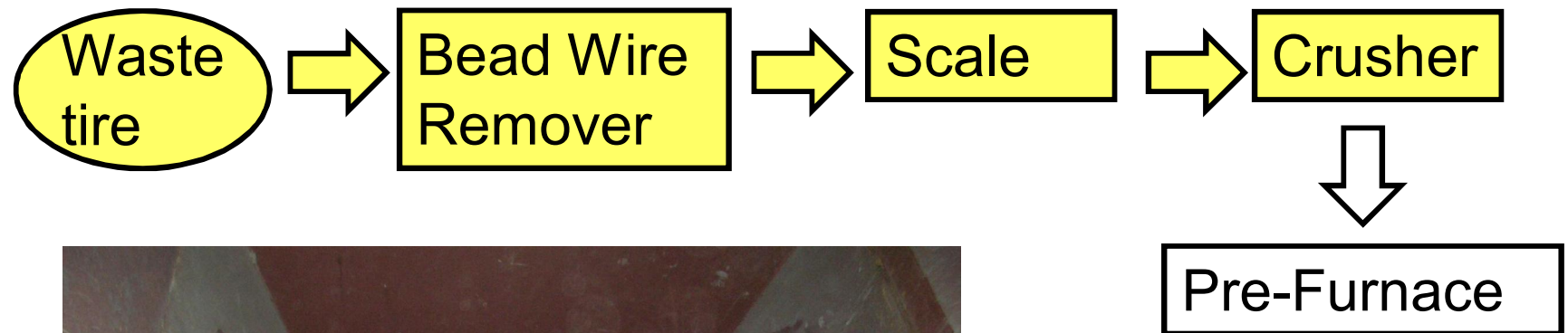
Bead Wire Remover

Using method of waste tire



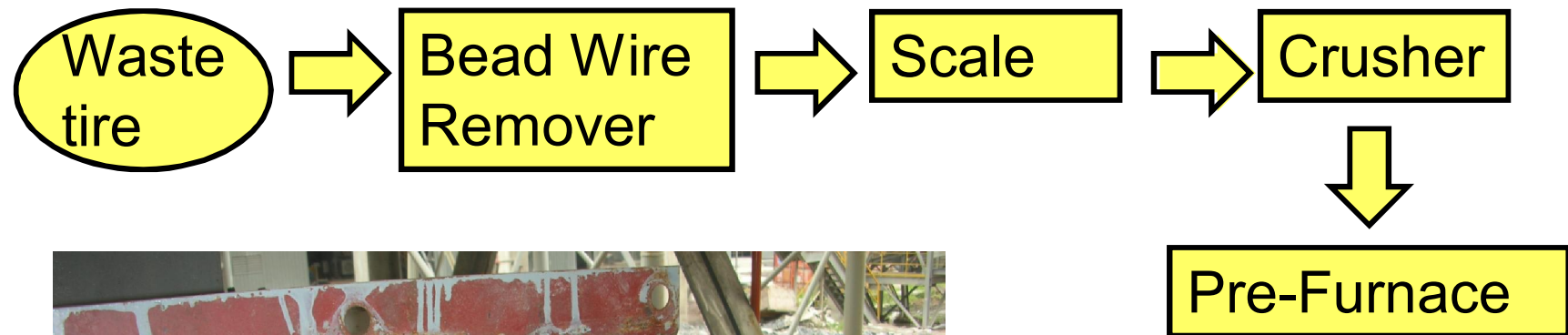
Roller conveyor and scale

Using method of waste tire



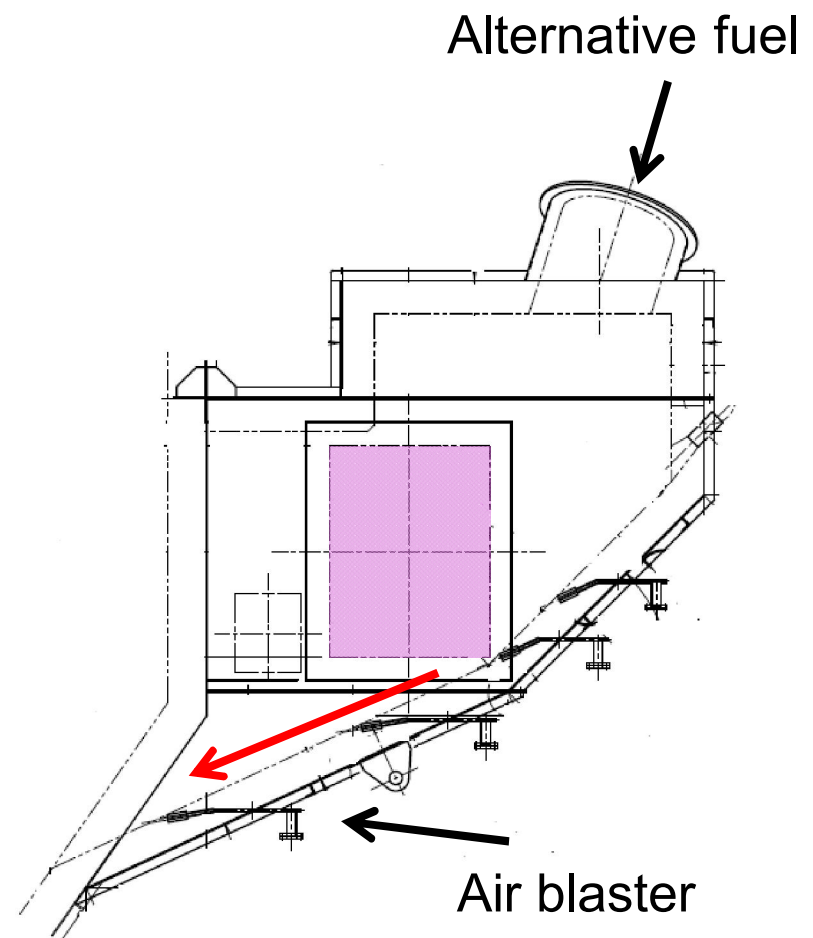
Tire crusher

Using method of waste tire

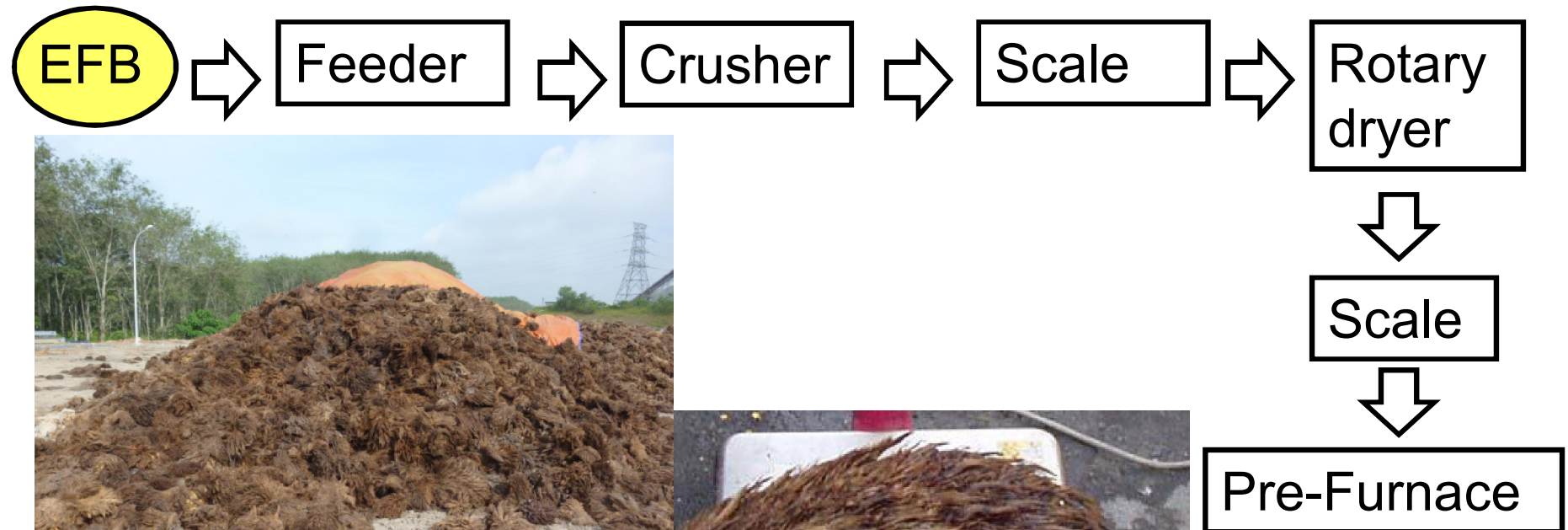


Crushed waste tire

Pre-Furnace

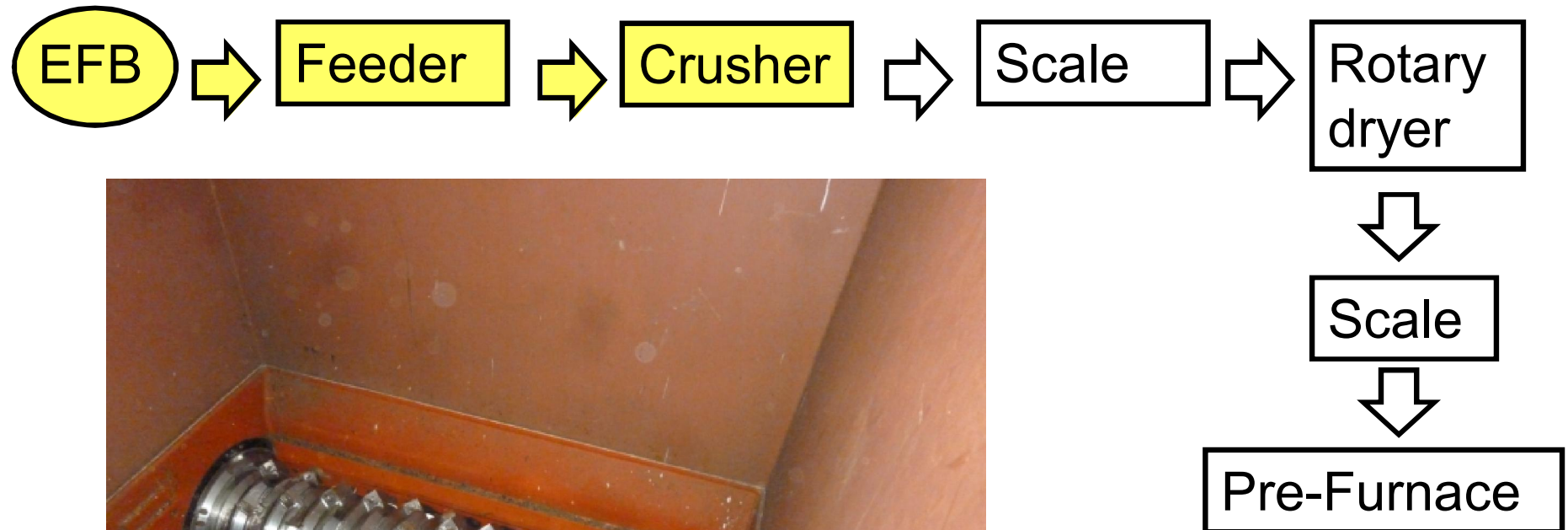


Using method of EFB (Empty Fruit Bunch)



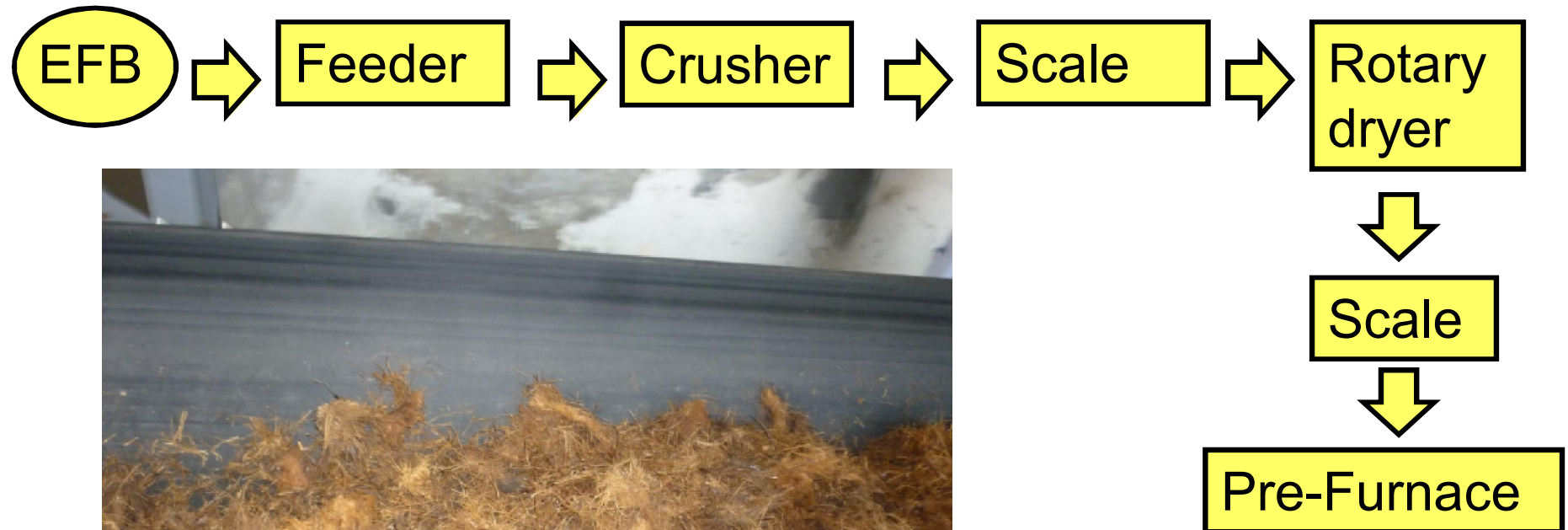
EFB
(Empty Fruit Bunch)

Using method of EFB (Empty Fruit Bunch)



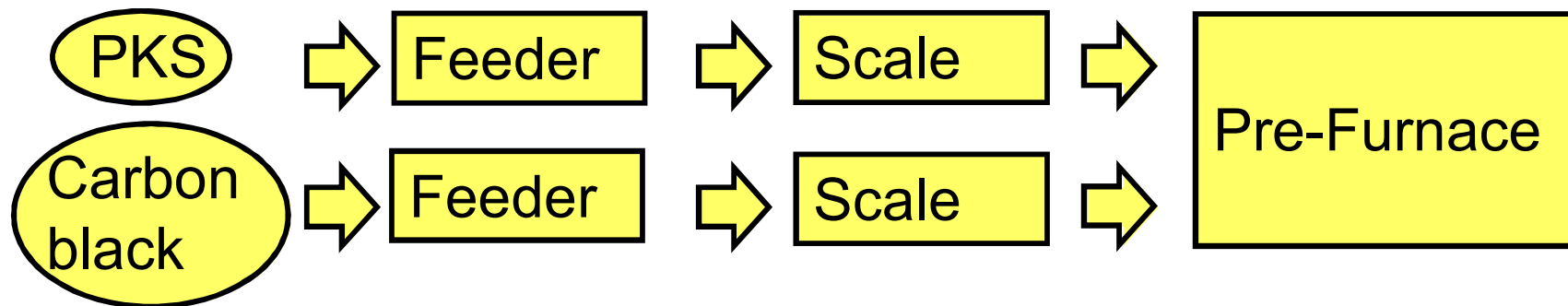
EFB Crusher

Using method of EFB (Empty Fruit Bunch)



Crushed EFB

Using method of PKS (Palm Kernel Shell),
Carbon black



PKS



Carbon black

Alternative fuel burning test 1

Use of alternative fuel			Coal reduction	
	Input (t/h)	Heat input (kJ/kg-cli)	Reduction (t/h)	Reduced heat (kJ/kg-cli)
Waste tire	0.6	112	5.9	817
EFB	2.1	176		
PKS	6.8	599		
Total	9.5	887		

Coal conversion thermal efficiency of alternative fuel : 92.1%

Alternative fuel burning test 2

Use of alternative fuel			Coal reduction	
	Input (t/h)	Heat input (kJ/kg-cli)	Reduction (t/h)	Reduced heat (kJ/kg-cli)
PKS	8.5	760	6.5	906
Carbon black	1.5	258		
Total	10.0	1,018		

Coal conversion thermal efficiency of alternative fuel: 89.0%

Summary

With No. 1 kiln of NSCI Bahau plant,

- (1) Through use of total 887kJ/kg-cli of waste tire, EFB and PKS, coal of 5.9t/h, 817kJ/kg is reduced.
- (2) Through use of total 1,018kJ/kg-cli of PKS and carbon black, coal of 6.5t/h, 906kJ/kg is reduced.
- (3) By use of alternative fuel, no influence on clinker is observed.

PIPOC 2013 PALM WASTE AS ALTERNATIVE FUEL FOR CEMENT PLANT

THE MODEL PROJECT FOR ALTERNATIVE FUEL COMBUSTION IN THE CEMENT INDUSTRY

PROJECT OUTLINE

This project has been planned and endorsed by **NEW ENERGY AND INDUSTRIAL TECHNOLOGY DEVELOPMENT ORGANIZATION JAPAN (NEDO)** in cooperation with **MINISTRY OF PLANTATION INDUSTRIES AND COMMODITIES, MALAYSIA (MPOC)**, **MALAYSIAN PALM OIL BOARD (MPOB)** and **MALAYSIAN RUBBER BOARD (MRB)**. The purpose of the project is to promote a safer method to dispose of agro, chemical, solid and industrial wastes, which shall be used as alternative fuels for a cement plant. The project has been advanced by the way of installing new equipment by NEDO, which consists of an alternative fuel combustion support system for use in the cement plant at **NEGERI SEMBILAN CEMENT INDUSTRIES SDN BHD (NSCI)**, a wholly owned subsidiary of **CEMENT INDUSTRIES OF MALAYSIA BERHAD (CIMB)**.

In order to mitigate environmental issues like the greenhouse gas (GHG) emissions, derived from fossil fuel combustion, palm biomass can be used to replace the fossil fuels such as coal. This may qualify for carbon credit under the Clean Development Mechanism (CDM). **TAIHEIYO ENGINEERING CORPORATION, JAPAN** has supplied equipment, machinery and technologies to utilize Palm biomass, waste tires etc., in the cement plant effectively and efficiently for the project with NEDO's trust.

The project is under construction and will be completed by the end of this year.

MAIN KEY SYSTEMS

TAIHEIYO CHLORINE BYPASS SYSTEM:
Dust containing chlorine and sulfur generated from the combustion of the alternative fuels in a calcining furnace or kiln will be separated, thereby preventing costs and clogs in a preheater caused by such dust.



TAIHEIYO COATING SOLUTION SYSTEM:
Base powders will be fed into the bottom of the calcining furnace in order to solidify sulfurous gases in the kiln's exhaust, thereby reducing residual gas deposits in the preheater and maintaining the kiln's stable operations.

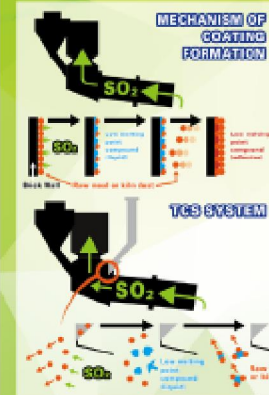


DIAGRAM FOR RELATED PARTIES



SCRAP TIRES AND BIOMASS FEEDING SYSTEM:
Used tires and palm biomass generated at a palm oil mills will be collected for use as alternative fuels to coal and fed into a kiln through the feeding system.

SCRAP TIRES & BIOMASS



CONTACT
Taiheiyo Engineering Corporation
Overseas Sales Dept. Tel: +81-3-5679-3260 Fax: +81-3-5679-3251
Email: tai@taiheiyo-eng.co.jp Website: http://www.taiheiyo-eng.co.jp/en/

Thank you

Taiheiyo Engineering Corporation
<http://www.taiheiyo-eng.co.jp>

