

Production of Refuse-Derived Fuel (RDF) as Alternative Fuel in Cement Kiln

2nd ANSWER 2019, 13-14 November 2019, Yogyakarta





SOLUSI BANGUN INDONESIA

SE**MEN** INDONESIA GROUP

In January 2019, Semen Indonesia Group represented by its subsidiary; PT Semen Indonesia Industri Bangunan (SIIB), acquired majority shares of PT Holcim Indonesia Tbk. The company then changed its name consequently to PT Solusi Bangun Indonesia Tbk on 11 February 2019.



53

Million tons of cement
per annum



Innovative portfolio



55%

Market share in
Indonesia



37.2

Trillion of revenue



> 8,000

Employees



OUR VISION

To be the Biggest Building Materials and Solutions Provider in The Region

MISSION

- **Customer Satisfaction oriented in every business initiatives**
 - **Implement best standards to secure best quality**
- **Focus to create environment preservation and sustainable social responsibility**
 - **Provide best added-values for all stakeholders**
- **Focus on human resources as the center of company development**

Sustainability as our competitive advantages

VISION:

To be the **Biggest Building Materials and Solutions**

Provider in the Region

PROFIT

Providing solutions (innovative products & services) to address urban problems (waste, floods, poor air quality, climate).

Generate revenue from sustainable solutions

SUSTAINABLE SOLUTION

PLANET

Demonstrating leadership in environmental stewardship and being a responsible role model for future generations.

1. CO₂ reduction
2. Utilization renewable resources
3. Biodiversity initiative
4. Water management

CIRCULAR ECONOMY

CLIMATE, WATER & NATURE

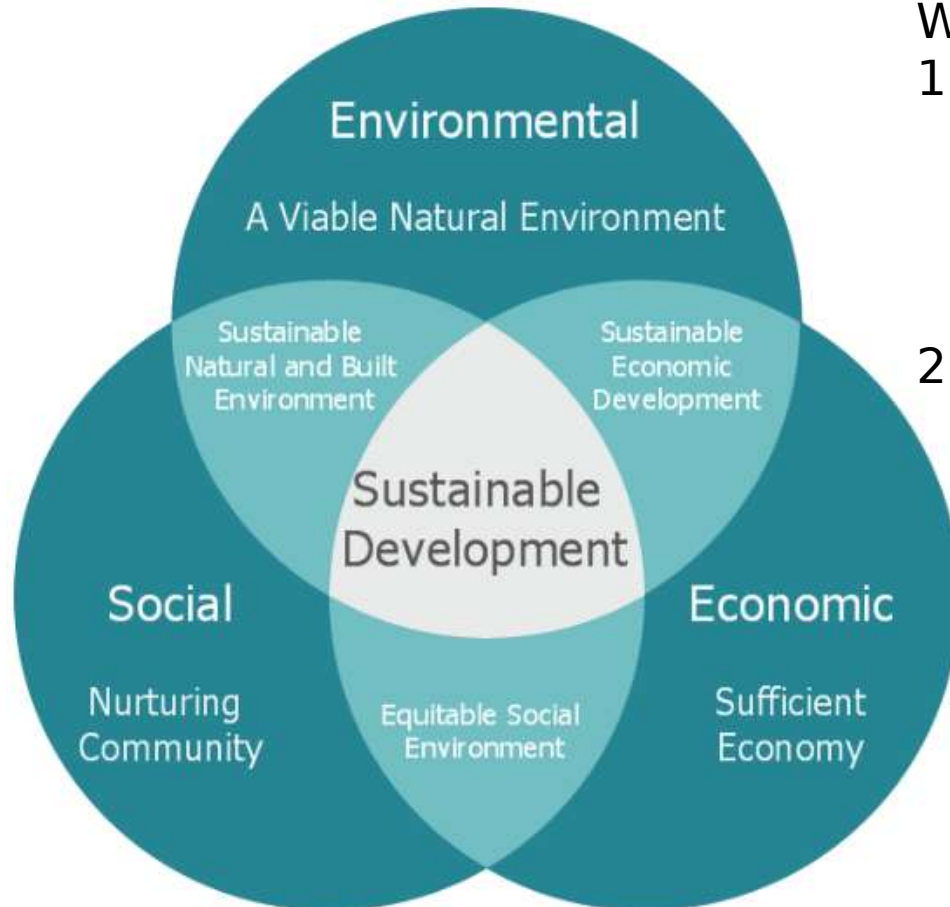
PEOPLE

Creating shared value to community.

1. Keeping people safe
2. Community empowerment through partnership
3. Social license acceptance

PEOPLE & COMMUNITY

Sustainability – Triple Bottom Line




Why we need SD?

1. Address Risk : Companies may not be able to continue to create capital over the long term if natural, social, financial and manufactured capital is being eroded elsewhere.
2. Attract capital: Investors are increasingly paying attention to environmental, social and governance (ESG) risks when making investment decisions.


"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."
(Bruntland report, UN 1987)

Sustainable Development Goals – SDGs indicator related to cement industry



7 AFFORDABLE AND CLEAN ENERGY

Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all.



Over the time, energy resources becoming more expensive and scarce. An alternative energy is a solution to maintain competitiveness and avoiding land degradation.

Sustainability and AFR

How AFR answers Sustainable Development demand

ECONOMICAL BENEFITS

Through AFR we are able to improve our industrial competitiveness by reduction of the overall manufacturing costs

- through two main factors:
1. Substitution of traditional fossil fuels and/or traditional raw materials
 2. Additional revenues from offering waste management solutions

ENVIRONMENTAL BENEFITS

Preservation of natural resources and reduction of the global and local environmental impacts.

1. Reductions of the overall emissions as the emissions of our kilns are not affected by the AFR, but other waste management solutions have a reduction of the greenhouse effect as no "fresh" fossil fuel is used
2. Reduction of the greenhouse effect as no "fresh" fossil fuel is used
3. Reduced natural resources extraction in our country
4. Safe and optimal waste treatment as the clinker manufacturing process ensures the right conditions for safe waste treatment

SOCIAL BENEFITS

The social benefits as follows:

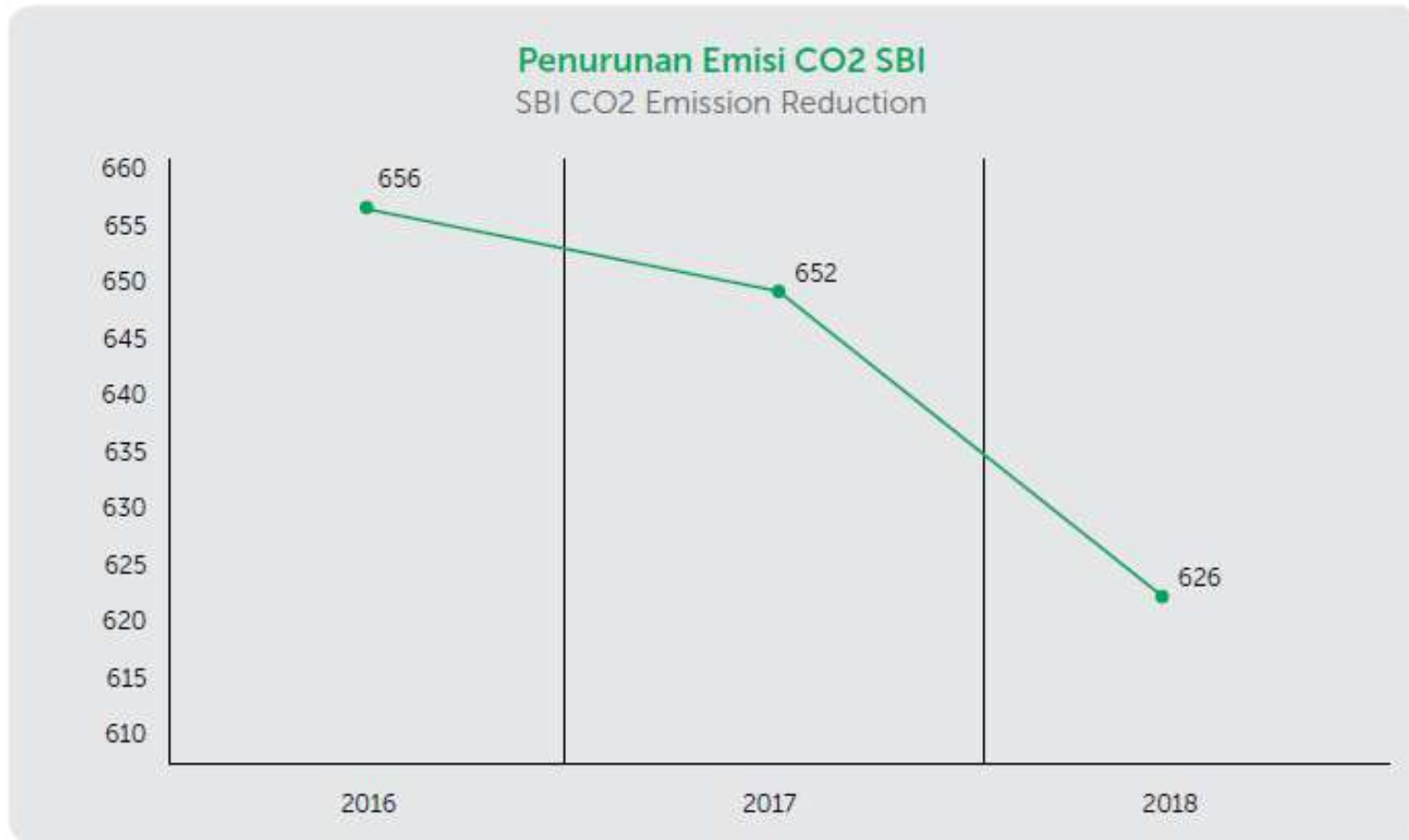
1. Effective contribution to waste management at local and regional levels.
2. Regional job creation in waste collection and pre-treatment facilities
3. Especially in developing countries, saving of public funds otherwise needed to build additional

incinerators as the infrastructure

SBI SD Dashboard 2016-2018

Pilar Pillar	2016	2017	2018
<p>Solusi Solutions</p>  <p>SDG #9, #11, #13</p>	<p>3,9% atau Rp 371 Milyar pendapatan dari Solusi Berkelanjutan</p> <p>3.9% or Rp 371 Billion of revenue from Sustainable Solutions</p>	<p>9,8% atau Rp 930 Milyar pendapatan dari Solusi Berkelanjutan</p> <p>9.8% or Rp 930 Billion of revenue from Sustainable Solutions</p>	<p>8,95% atau Rp 928 Milyar pendapatan dari Solusi Berkelanjutan</p> <p>8.95% or Rp 928 Billion of revenue from Sustainable Solutions</p>
<p>Iklim Climate</p>  <p>SDG #7, #12, #13</p>	<p>655kg CO₂ per ton cemat atau 21,2% lebih rendah dibandingkan tahun 1990</p> <p>655kg CO₂ per ton cemat or 21.2% reduction compared to 1990</p> <p>8,1% Substitusi Energi Panas (Thermal Substitution Rate/TSR) dari Bahan Bakar Alternatif</p> <p>8.1% Thermal Substitution Rate (TSR) from Alternative Fuel</p>	<p>651kg CO₂ per ton cemat atau 21,6% lebih rendah dibandingkan tahun 1990</p> <p>651kg CO₂ per ton cemat or 21.6% reduction compared to 1990</p> <p>8,32% Substitusi Energi Panas (Thermal Substitution Rate/TSR) dari Bahan Bakar Alternatif</p> <p>8.32% Thermal Substitution Rate (TSR) from Alternative Fuel</p>	<p>630kg CO₂ per ton cemat atau 24,2% lebih rendah dibandingkan tahun 1990</p> <p>630kg CO₂ per ton cemat or 24.2% reduction compared to 1990</p> <p>8,16% Substitusi Energi Panas (Thermal Substitution Rate/TSR) dari Bahan Bakar Alternatif</p> <p>8.16% Thermal Substitution Rate (TSR) from Alternative Fuel</p>

CO2 Emission Reduction 2016-2018



SBI Sustainable Solution Initiatives



Nathabumi – Business Unit Providing Waste Management services using Co-processing Technology at Cement Kiln

Nathabumi – Professional Waste Management Services

- **Since 2007 as Business unit at PT SBI Tbk** - We do Waste Management for Industrial Waste and Municipalities for Hazardous and Non Hazardous waste material
- We are processing and managing waste from Industrial and municipalities activities to be eliminate through our co-processing method in Cement Kiln as Alternative Fuel and Raw material
- The business unit has managed to provide waste management solution to more than 400 clients: such as Chevron, Pertamina, Unilever and Nike.
- **Hazardous Waste Management Services**
- **Non Hazardous Waste Services**
- **Field Services**
- **Tailor Made Services**
- **Consulting Services**
- **Secured Destruction Services**
- **ODS Destruction Services**
- **Document Destruction Services**



A Wide Range of Waste We Can Handle



Solid

- Plastics and used or contaminated packaging materials
- Oil and solvent contaminated rags
- Consumer products (Off Spec or expired)
- Rubber waste or manufacturing off cuts
- Rejected packaging materials
- Textile or garment waste
- Bottom ash and other process residues
- Waste Water Treatment Sludge or filter cake
- Foundry Sand
- Contaminated Soil

Liquid

- Solvents
- Spents oils
- Contaminated liquids

Sludge

- Oil sludge
- Paint sludge
- Petrochemical sludge

Gas

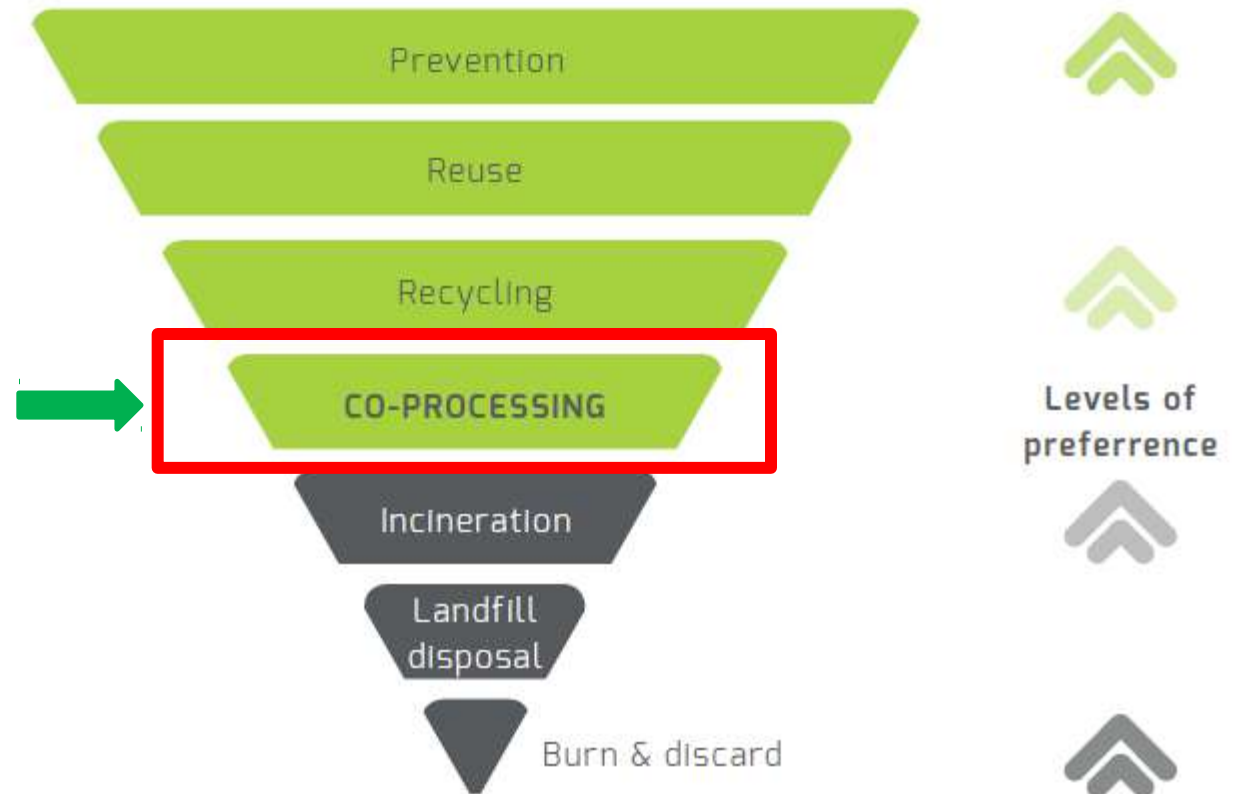
- Phased out or contaminated refrigerant gases

Regulatory Compliance

Entity	Unit/Plant	Scope	Permit	Deskripsi
PT Solusi Bangun Indonesia Tbk	Narogong Plant	AF, AR	Kep Men LH Nomor 478 Tahun 2015	Permit to manage & utilized hazardous waste materials (B3)
PT Solusi Bangun Indonesia Tbk	Cilacap Plant	AF, AR	Kep Men LH Nomor 896 Tahun 2016	Permit to manage & utilized hazardous waste materials (B3)
PT Solusi Bangun Indonesia Tbk	Tuban Plant	AR	SK No 392/Menlhk/Setjen/PLB.3/8/2017	Permit to manage & utilized hazardous waste materials (B3)
Entity	Unit/Plant	Cakupan	Permit	Deskripsi
PT Solusi Bangun Andalas Tbk	Lhoknga Plant	AR (Flyash Bottom Ash)	SK No 620/Menlhk/Setjen/PLB.3/8/2016	Permit to manage & utilized hazardous waste materials (B3)

Co-Processing, The Safer & Environmentally Friendly Solution

SBI through **Nathabumi**,
Specialized in a secure
form of waste management
known as Co-processing.



Co-processing - means the substitution of fossil fuel and primary raw material by waste derived materials in industrial processes.

In The Cement Kiln

Q: What happens to the waste?

A: It is subjected to ultra high temperature over long residence time, completely destroys all organic materials.

Q: What about gas emissions?

A: Chlorine and sulphur from organic material produce acid gases (HCL & SO₂) which are absorbed and neutralised by limestone and other alkaline materials.

Q: And everything else?

A: Inorganic constituents become part of the clinker.

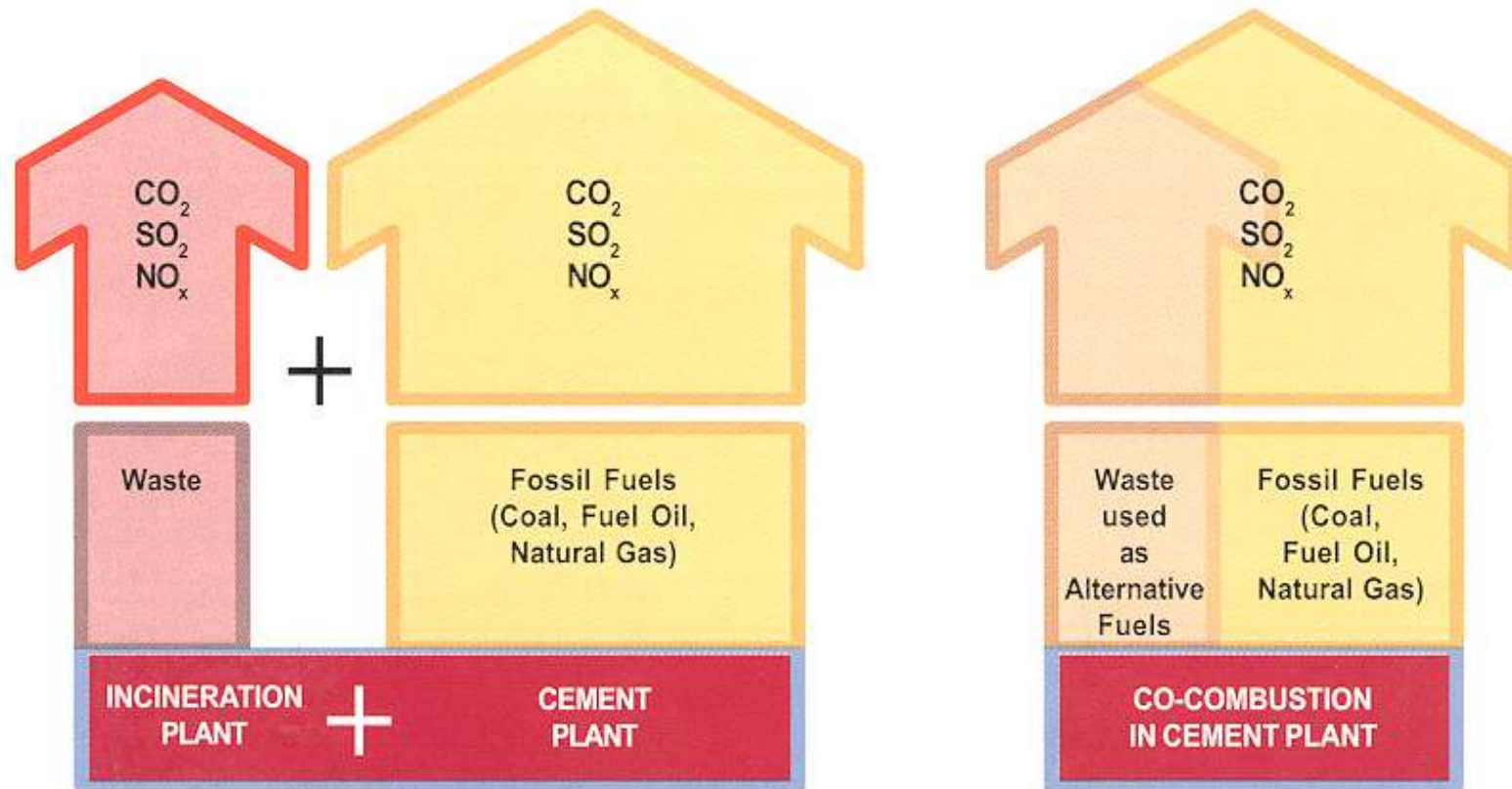
Q: Can waste affect cement quality?

A: All waste inputs are carefully assessed to guarantee the compatibility of the materials with the cement process and the quality of cement.



Flame temperature
>1,800°C

Waste Utilization Background



Utilization of Waste Contributes to Reducing Global Warming

Minimizing Risk by Maximizing Work Safety

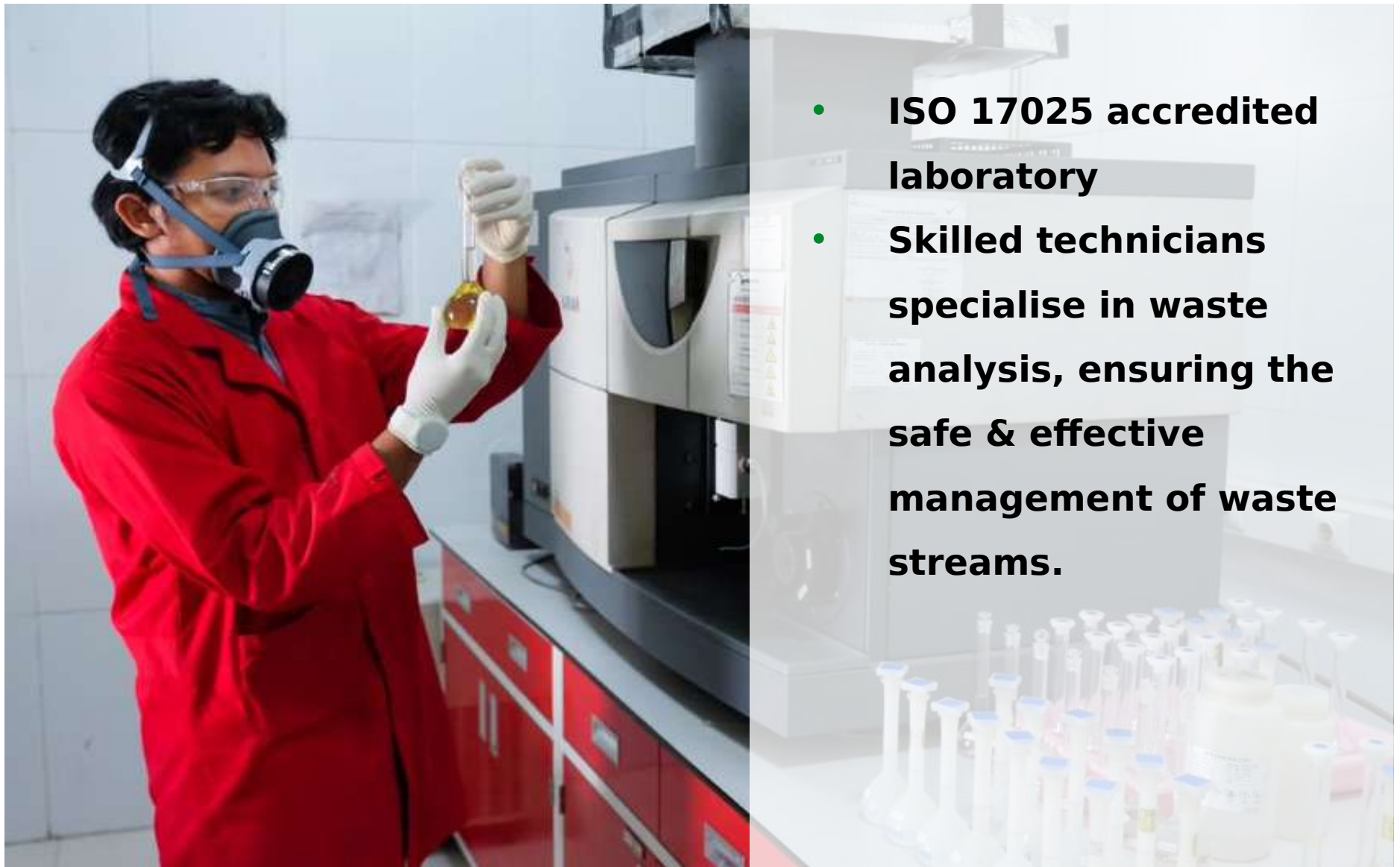
- Internal & External routine audits
- OHS Training for transporters and contractors
- Customer Manifest Training
- We held certification in ISO 90001, ISO 14000 and OHSAS 18001 Quality Management System.
- We identify changes to laws and regulations and periodically analyze the effectiveness of implementation.
- We ensure implementation of the AFR Directive & Policy as part of our commitment to compliance.
- We maintain good relationships with our stakeholders (the surrounding community, government, employees and contractors).



Waste Pre-treatment Facility in Narogong Plant



Waste Laboratory



- **ISO 17025 accredited laboratory**
- **Skilled technicians specialise in waste analysis, ensuring the safe & effective management of waste streams.**

Diverse Client Base and Extensive Reach

Hazardous Waste Management



Secured Destruction



On-Site Waste Management



Waste Transportation Services



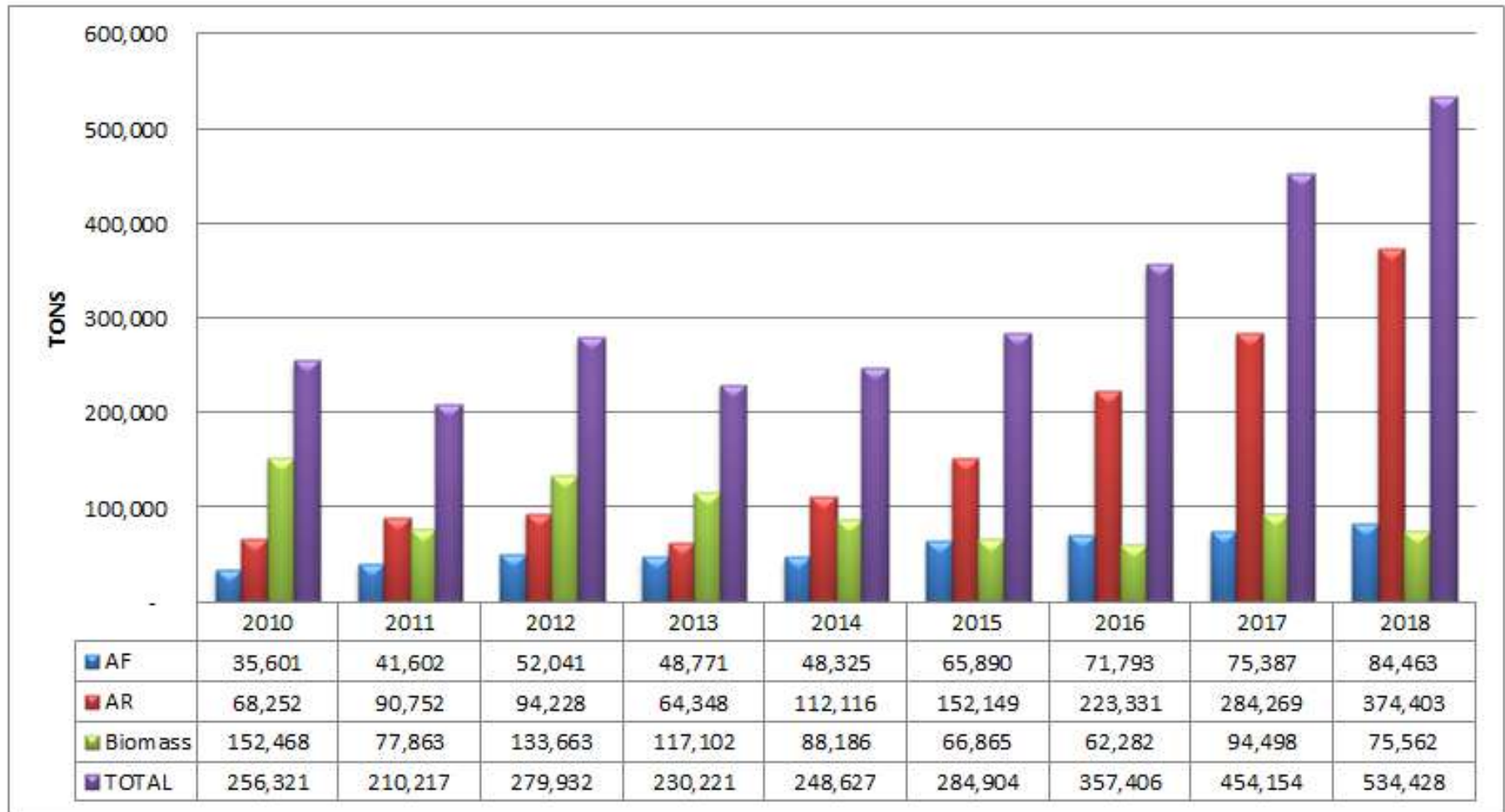
Waste Analysis Laboratory



Waste Consultation Service

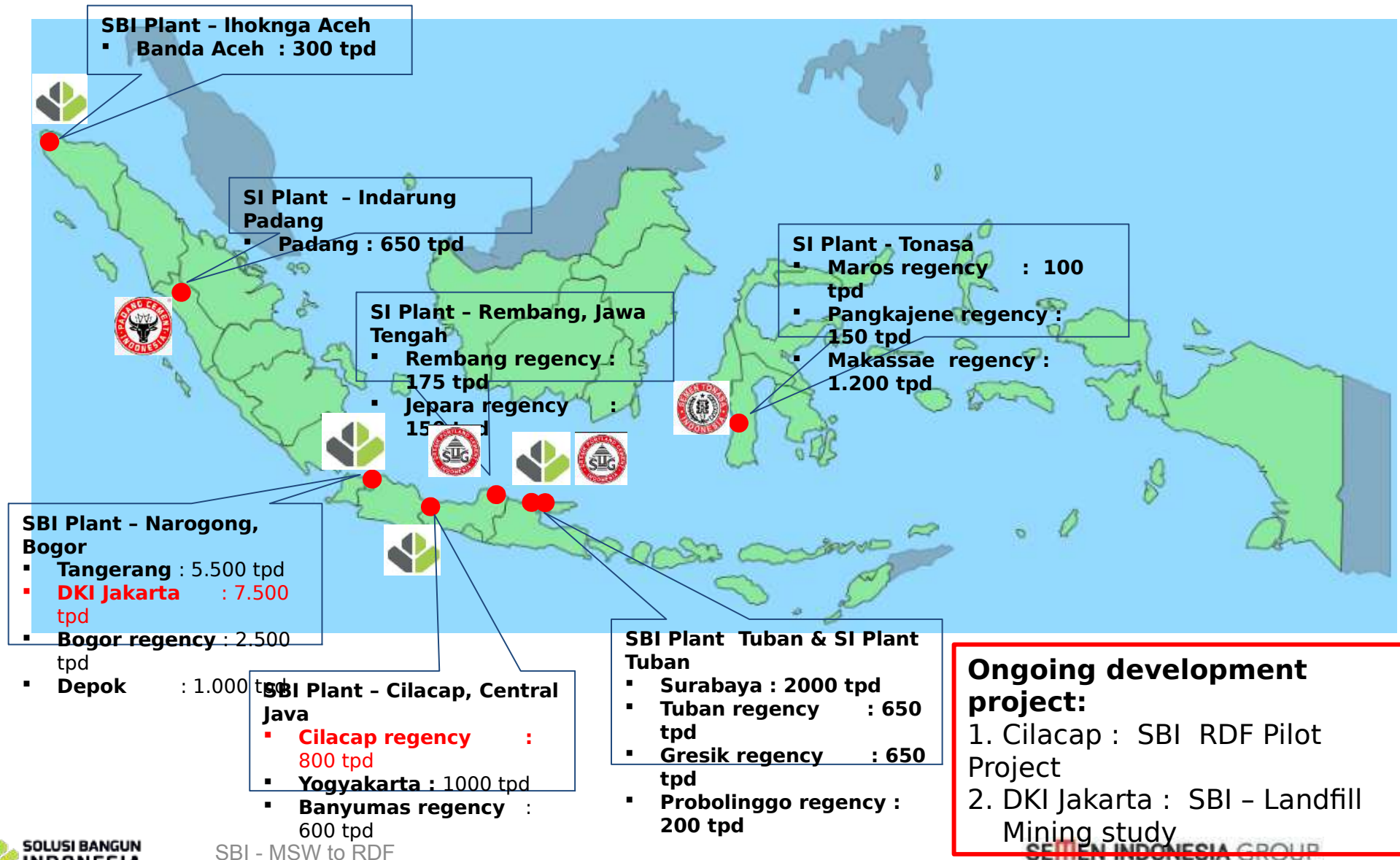


Waste Co-processing Volume



MSW to RDF Development Project

Map of potential future development of MSW business in Semen Indonesia Group

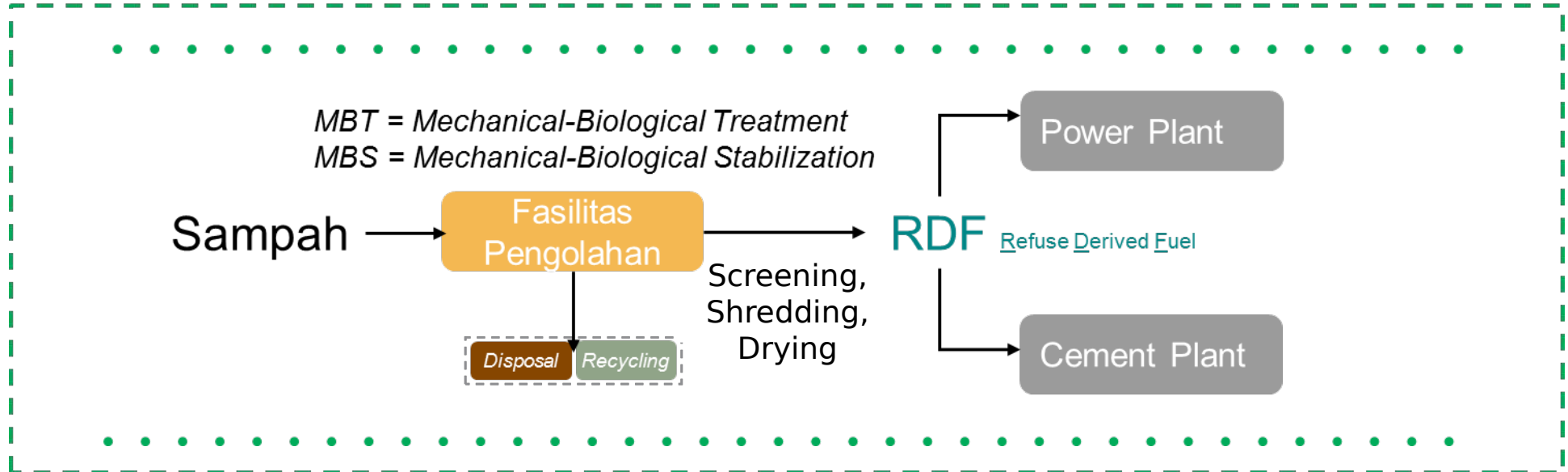


Technology of processing MSW into fuel

Basic principle of MSW utilization as alternative fuel

Sampah

Incinerator



No / too small / separate line calciner:

Sampah

Gasifier

Low-grade

Syngas

Cement Plant

or power plant

RDF or Refused Derived Fuel

Is renewable energy produced from municipal solid waste with pre-treatment process

Technology of processing MSW into fuel

Waste type that required specific treatment

COMPONENT	INDONESIA (JAKARTA) (%)	TYPICAL EUROPE (%)
Food and Yard Waste	67	20
Paper (high CV)	6	40
Plastic (high CV)	17	6
Metal	0.5	8
Glass	1	8
Other (textiles, stone, sand, etc.)	8.5	18
TOTAL	100	100
Moisture content %	55-60	20-25

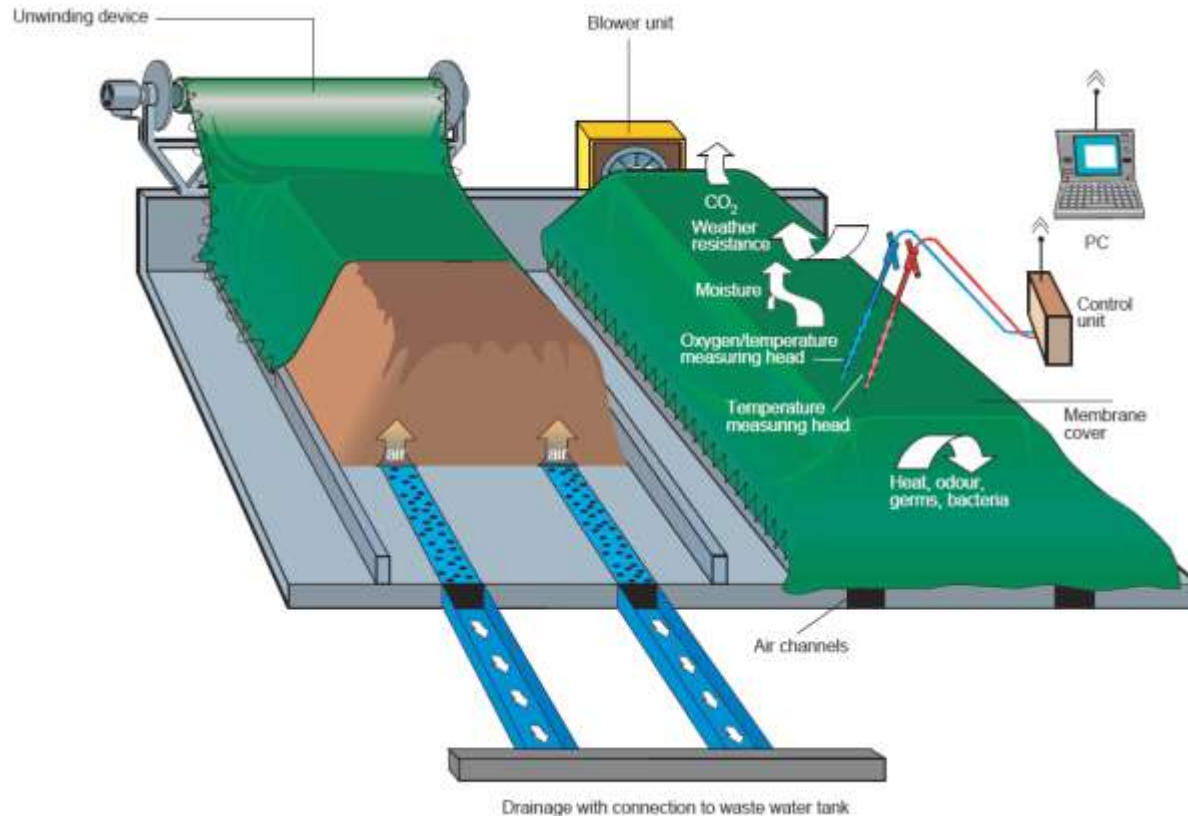
- To sort high CV waste in Indonesia is not economic viable
 - In each ton there is lesser high CV material in Indonesia waste type
 - Government required full solution
- Food waste / organic waste are the biggest composition in Indonesia
 - Contribute to high moisture level content in the waste
 - There is a unique condition that can be benefit in a waste management processing

Source: Clinton Foundation's study in Jakarta

Because of the average of Indonesia waste are having high moisture content, therefore to turn it into alternative fuel required a drying process technology.

Technology of processing MSW into fuel

Bio Drying Membrane



- Biological drying using Bacteria from organic waste
- Special membrane that can evaporate water but will not penetrate water from outside
- Air flow and turning process to help bacteria stay alive during the drying process
- It takes 21 days of the drying process to produce RDF with the specifications required by the Cement plant

Technology of processing MSW into fuel

RDF specifications that can be used in the cement industry

		RDF
NCV	kcal/kg	3.000
H ₂ O/moisture	%	25
Ash	%	15
Chlorine	%	0.8
Sulfur	%	0.5



From our commissioning at RDF Plant in Cilacap, the drying processing of fresh MSW can produce +/- 50% of RDF product that consists of:

1. Inert (0-20mm) equivalent to compost = 15%
2. RDF Product (20-50mm) = 51%
3. Reject product (>50mm) Oversize = 34% (Re-shredded) and combined into RDF product

Case Study - Cilacap MSW to RDF Pilot Project

Cilacap



120 ton per day
Fresh waste

Jeruk Legi



5 - 15 ton per day
residu (+/- 15%)

40 - 60 ton per day
RDF /product
(+/- 50%)

+/- 35 % air Will
evaporate
during drying
process

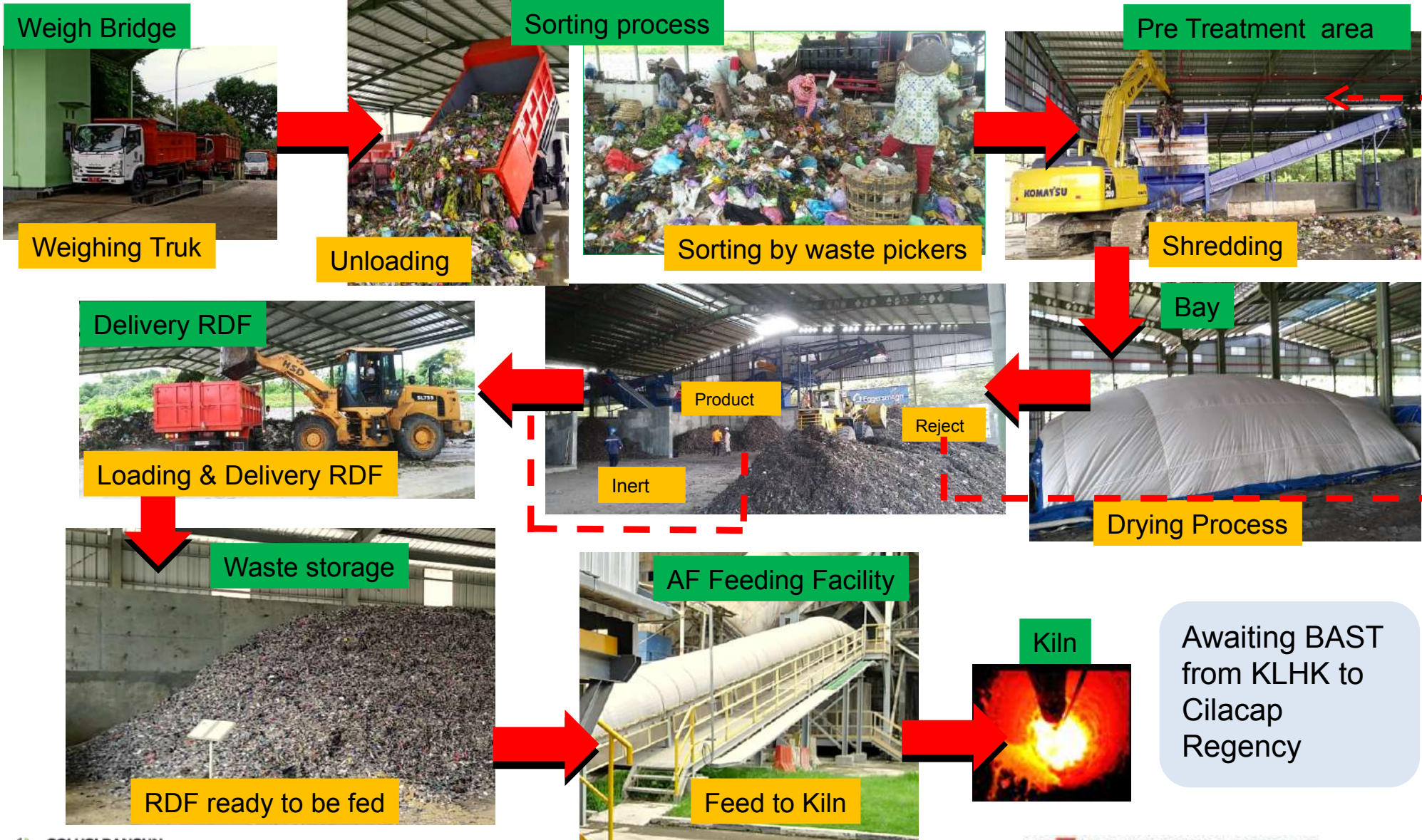


1 - 3 ton per day
Recyclable
materials(>3%)



SBI Cilacap

Process Flow MSW to RDF in Jeruk Legi Cilacap



Cooperation concept between Cilacap Regency, RDF operator and SBI

Waste collection

Govt role



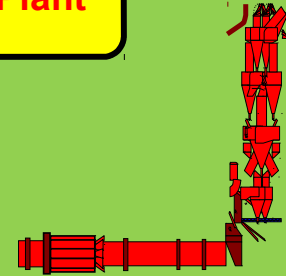
Waste processing

RDF Operator as business unit



Off Taker

Cement Plant



Transporting waste to RDF plant facility



Transporting to cement plant



Manage Residue and Leachate Treatment

Waste processing facilities

- Waste processing
- Storing
- Recyclables

Managing Risk at Kiln:

- Emission
- Production

Regency government

Case Study - Cooperation with DKI Jakarta for Landfill Mining



Project Background:

- DKI government are required to find solution of their volume waste that goes in Bantargebang - 7.500ton per day
- Capacity at Bantargebang are vastly reduced over many years of utilization

PT SBI Solution:

- **Landfill mining:** To conduct landfill mining for the old waste volume to be co-processed at cement Kiln. A study need to done to ensure waste quality that fit cement plant requirement

Project status:

- Signed 1 year MOU to conduct landfill mining study up to January 2020
- We have collected and study a sample up to 5 meter depth of the designated old waste pile
- Operational target for landfill mining Q1 2020

Development Planning with other cities

- **RDF for Lhoknga Plant:**
 - Early stage proposal development ready to be presented to Banda Aceh government
- **RDF for Tuban Plant:**
 - Conducted mapping to confirm volume data
 - Follow Up study for details follow up
- **RDF Jogjakarta:**
 - Follow up with Government for their Piyungan dump site
- **Development of potential RDF market:**
 - Exploring other market outside cement plant such as other thermal processing industry (Coal-Based Power Plant)



Lesson Learned and Challenges

Required extensive lead time to introduce, propose and execute project

- Mindset
- Technology selection
- Business modelling
- Tender process

Financial engineering scheme to enable all stakeholders participation and project viability (Local city government in particular):

- Tipping fee mechanism
- CAPEX and OPEX cost sharing between stakeholders
- Less aid fund available in Indonesia for waste management

Regulation support/consistency to support RDF project

- Environmental regulation discourage cement plant using AFR
- Provincial government still having issues on how to access state budget on the waste disposal fee

The Benefits

Profitable and beyond by creating sustainable solutions

Three main benefits are to be expected:

EXPECTED BUSINESS PROFIT



- Revenue from sustainable solutions
- Reduced fuel costs
- Increased TSR
- Brand building

EXPECTED ENVIRONMENTAL BENEFIT



- Drastically reduce the need for landfilling
- Reduce odor & leachate
- Significant greenhouse gas reduction

EXPECTED SOCIAL BENEFIT



- Provision of land for active uses
- Better working environment for waste pickers
- Better living condition



SOLUSI BANGUN INDONESIA

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