



Improvement of Industrial Wastewater Treatment & Enhancement of Water Recycle with ZLD Application in the Existing Refinery and Petrochemical Facilities

TOYO ENGINEERING CORPORATION - ATLATEC

**February 6, 2013
Doha, Qatar**

Introduction: Toyo Engineering Corporation



- Client Value Enhancement -

<<http://www.toyo-eng.co.jp/>>

- Established : May 1, 1961
- Listed : The first section of Tokyo Stock Exchange
- Location/Address
 - <Head Office> : 2-8-1 Akanehama Narashino-shi, Chiba 275-0024, Japan
 - [TEL] : +81-47-451-1111
 - [FAX] : +81-47-454-1800
 - <Tokyo Head Office> : Shin-Marunouchi Building 11th Floor, 5-1 Marunouchi 1-chome, Chiyoda-ku, Tokyo 100-6511, Japan
 - [TEL] : +81-3-6268-6611
 - [FAX] : +81-3-3214-6011
- Net Sales (Y2011) : US\$1.92 Billion
- Backlog of Contracts (Y2011) : US\$4.37 Billion
- Number of Employees : 2,345

Global 10,000+

(including 819 Domestic Groups)



President and CEO
Katsumoto Ishibashi

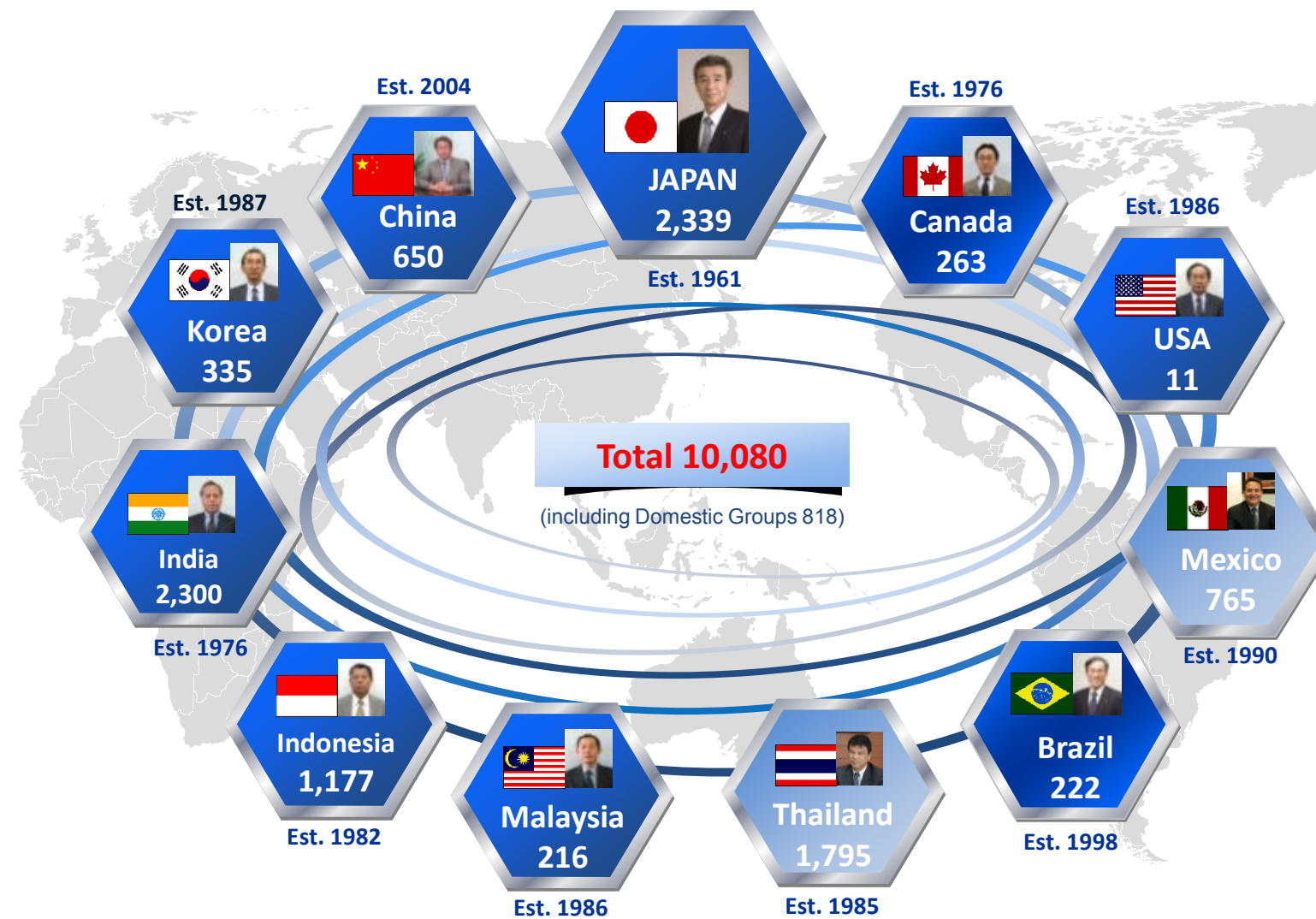


Head Office:
Chiba, Japan



Tokyo Head Office:
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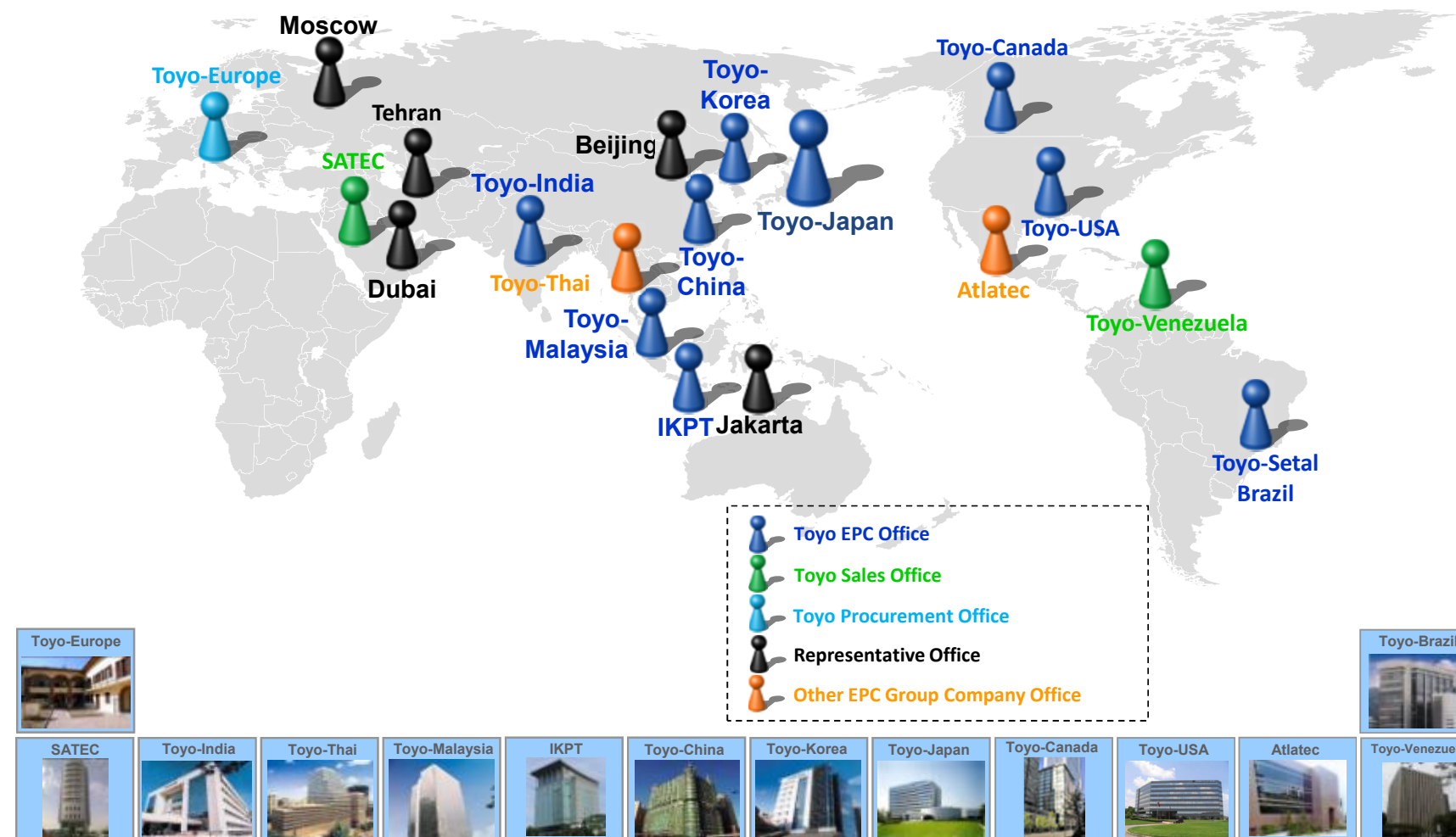
Global EPC Operation by Toyo Engineering Group



TOYO Global Network



As of October 2012



Major Business Domains



Process Plants

- Oil & Gas Exploration & Production
- FPSO/Offshore Platform
- Oil & Gas Treatment
- Gas Processing
- LNG
- Gas-to-Liquid
- Refinery
- Aromatics
- Petrochemicals
- Polymers
- Fertilizers & Chemicals

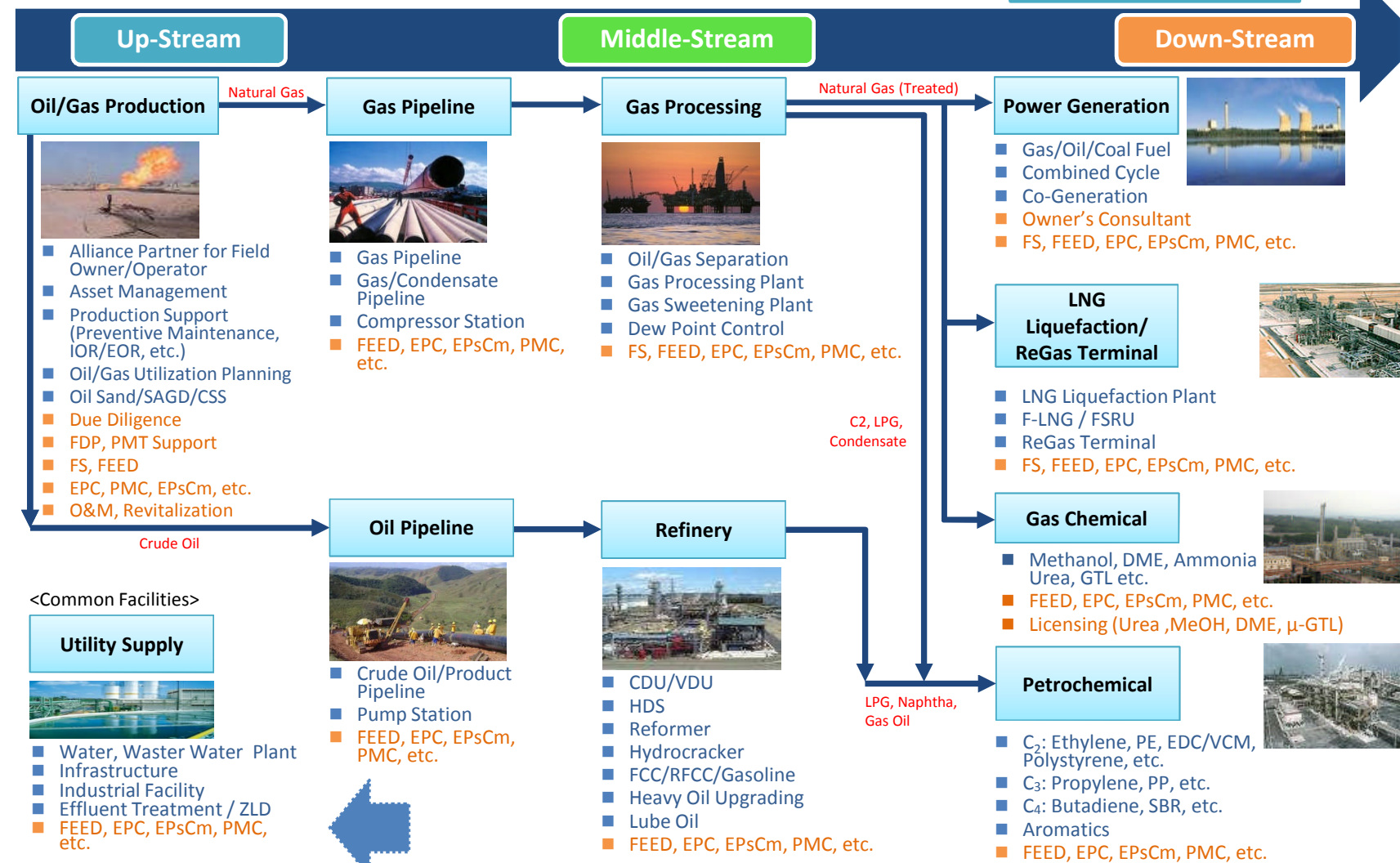
Non-Process Plants

- Power
 - Gas Firing
 - Coal Firing
 - IGCC
- Transportation System
 - Rail Systems
 - Monorail
 - Automatic People Mover (APM)
- Infrastructure
 - Airport System
- Pipeline
- Water
 - Raw Water Treatment
 - Desalination
 - Waste Water Treatment
- Utility Facilities
- Industrial Systems
 - Pharmaceuticals & Fine Chemicals
 - Food Processing
 - Supply Chain & Logistics Solution
 - Microelectronics & Semiconductor
 - Mechatronics
 - Business Consulting and Solution
- Information Technology
 - ERP Solution Systems (SAP, MC Frame)
 - Manufacturing & Logistics Execution Systems
 - Network & Multimedia Systems
- Environment
 - Water and Off Gas Treatment
 - Waste Disposal
 - CDM Projects

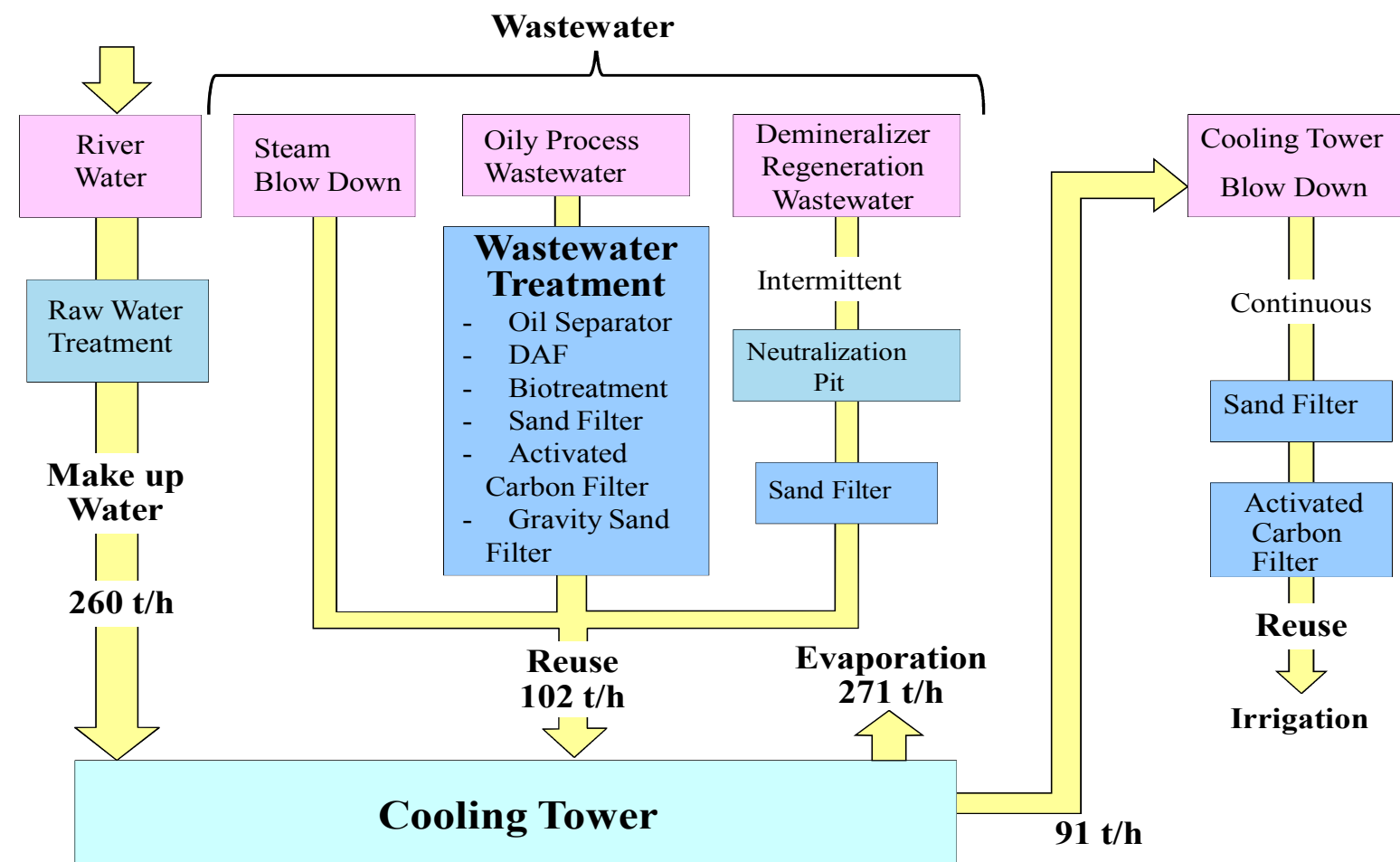
TOYO's Activities throughout Oil & Gas Value Chain



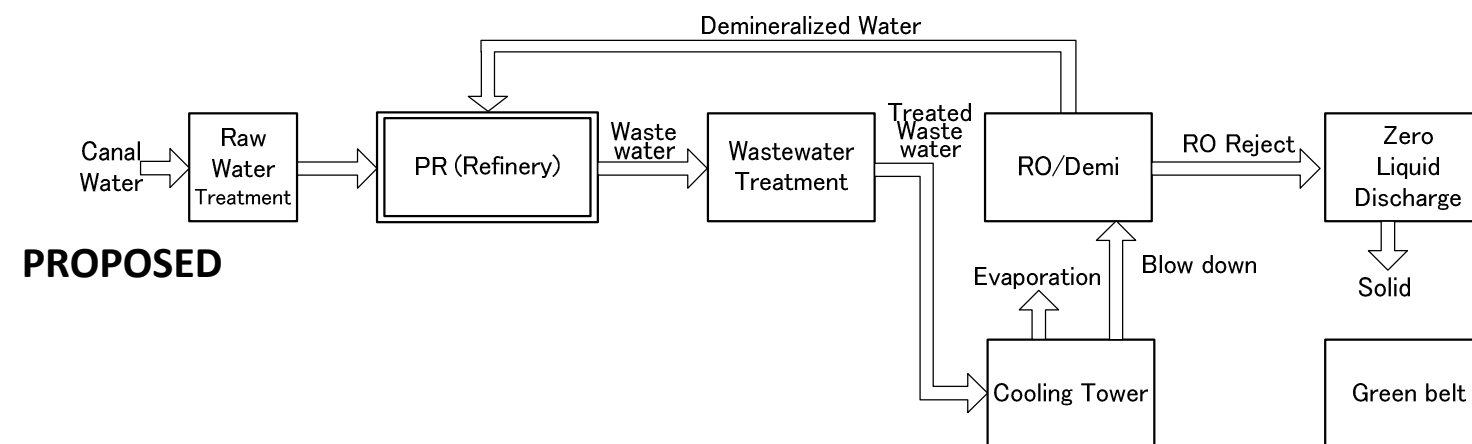
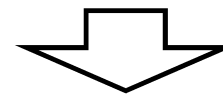
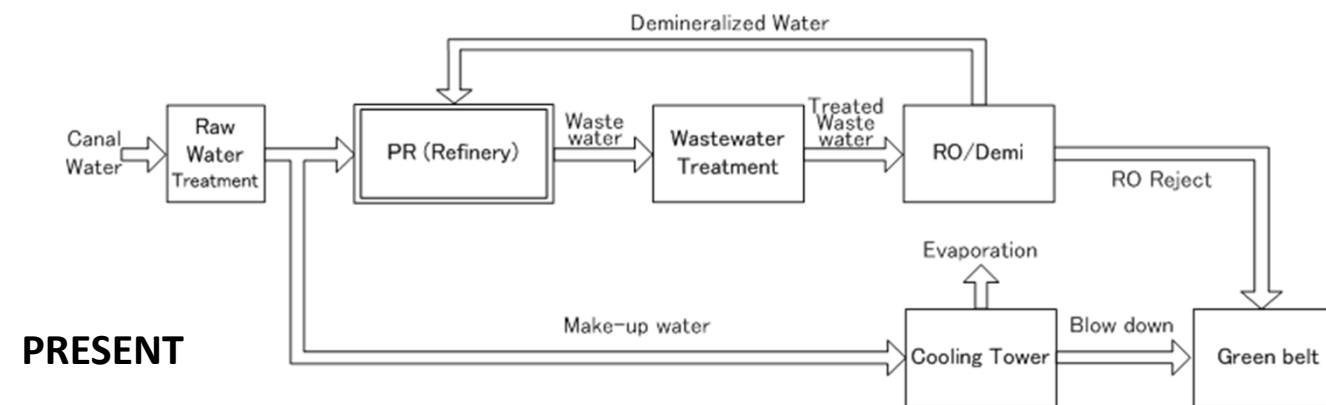
<LEGEND>
 ■ Business Field, Type of Plant
 ■ Scope of Work



Example 1: Refinery Wastewater Treatment & Reuse



Example 2: Brown Field - Improvement and Water Recycle



Experience in Refineries in Mexico

PEMEX Cadereyta

Capacity : 52,000TPD

Treatment :Tertiary + ZLD

COD : 1998

12 Years BOT +

Extension



PEMEX Minatitlan

Capacity : 39,000TPD

Treatment :Tertiary

COD : 2001

12 Years BOT



PEMEX Madero

Capacity : 13,300TPD

Treatment :Tertiary +
ZLD

COD : 1999

12 Years BOT +

Extension



PEMEX Tula

Capacity : 21,000TPD

Treatment :Tertiary

COD : 2000

12 Years BOT



Other Experience for Refineries

Mexico/PEMEX UDAS Cadereyta

Client : PEMEX/EPC
 Location : Cadereyta, Mexico
 Capacity : 14,300TPD
 Treatment : Tertiary & RO
 COD : 2010



Hungary/Duna Mol Refinery

Client : Hungarian Oil & Gas/BOT
 Location : Szazhalombatta, Hungary
 Capacity : 19,700TPD
 Treatment : Biological
 COD : 2001



Venezuela/San Jose

Client : Aguas Industrial de San Jose/BOT
 Location : Venezuela
 Capacity : 138,240TPD
 Treatment : Tertiary
 COD : 2005



China/Dalian Petrochemical WWTP

Client : PetroChina/DB
 Location : Dalian, China
 Capacity : 1,000TPD
 Treatment : Biological
 COD : 2008



Why PEMEX introduced ZLD (Zero Liquid Discharge)?

Environmental Restrictions

Environmental regulation became stricter

Madero

- Located in a resort area.
- Needed to stop discharging wastewater.

Cadereyta

- Located in a desert area.
- Needed to stop discharging wastewater.

Scarcity of Fresh Water

It had become difficult for PEMEX to secure water source

Madero

- Champayan Lagoon which was a water source for Madero Refinery is very important potable water source for municipals. PEMEX needed to reduce the usage of the lagoon water.

Cadereyta

- Cadereyta Refinery used to rely on River Ramos and Well Water and both water quantity was not stable and enough.

PEMEX Strategy

- To improve water use efficiency, PEMEX set a target to reuse wastewater in different process in its refineries as many as possible.
- It was required to comply with stricter environmental regulation in accordance with Mexico's participation to NAFTA.

Recycling Water - Benefit of ZLD System

Due to rapid changes such as ; population upsurge, industrialization and raising of environmental awareness, many countries and companies are now facing various problems related to water.

- Scarcity of fresh water resources → Need to improve water use efficiency
- Environmental pollution by industrial discharge → More strict environmental regulation



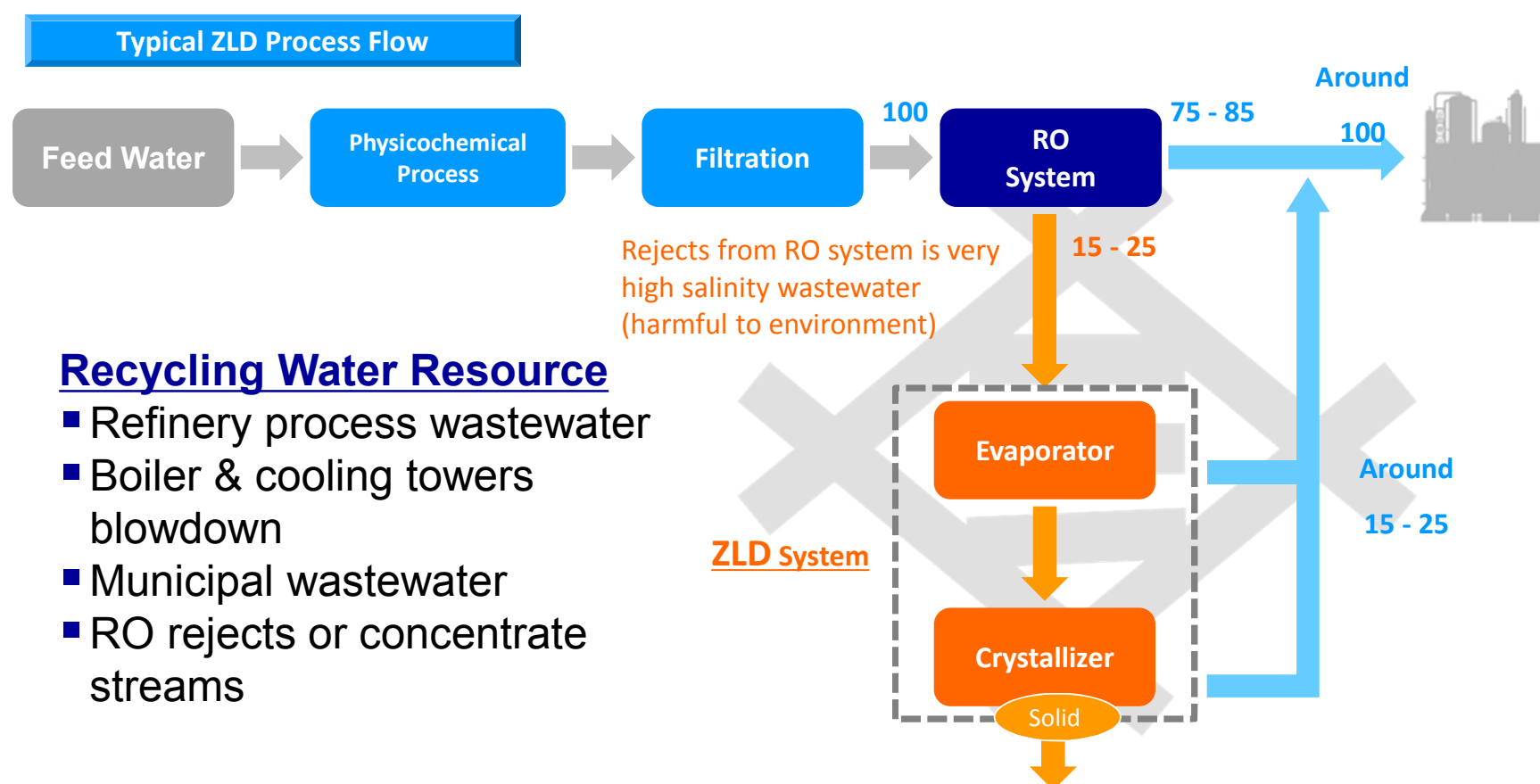
ZLD System provides solution to these problems

Benefit of ZLD

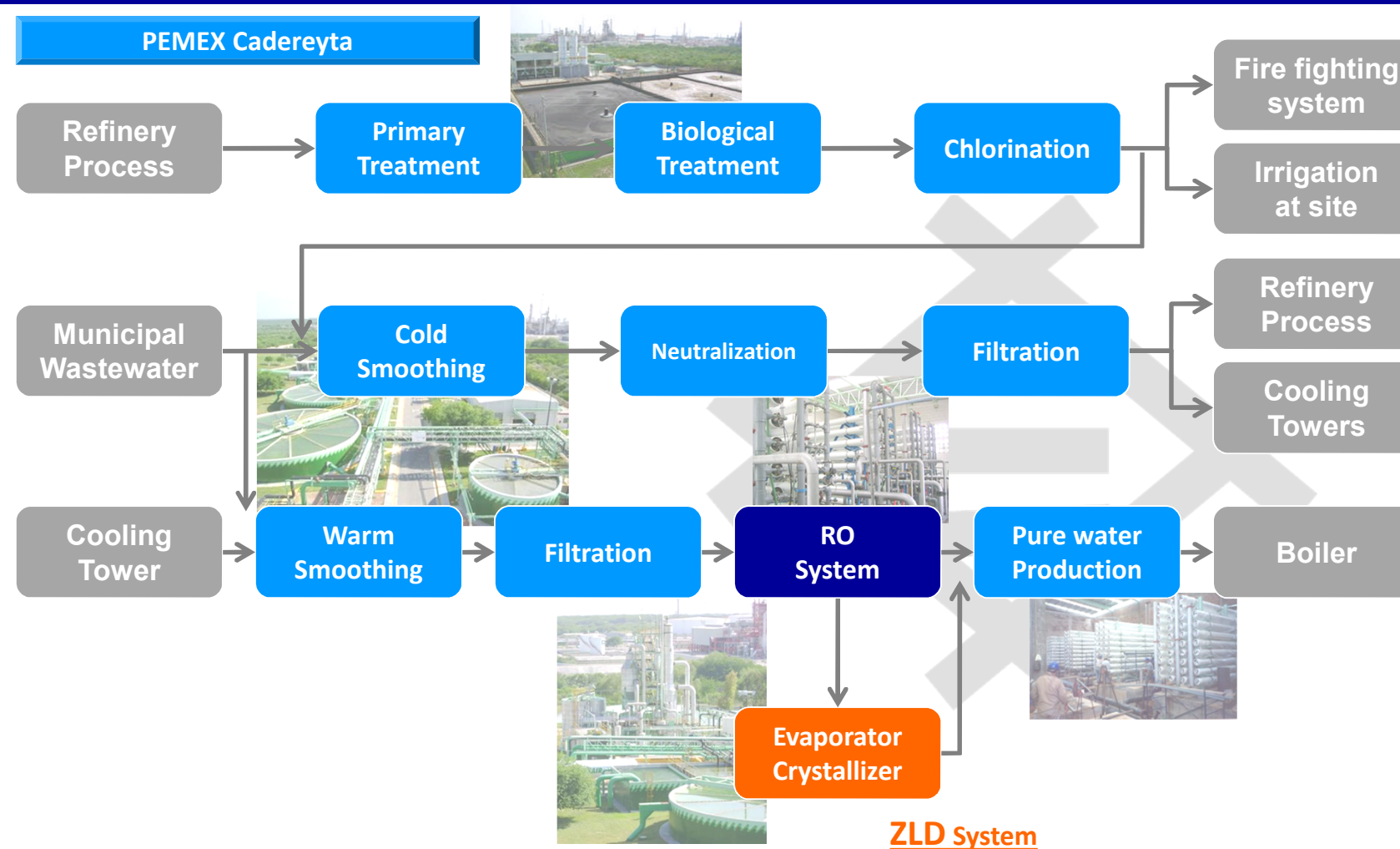
- Recovery of high quality water from wastewater stream
- Saving municipal or natural water resources by optimizing water recycling
- Securing stable/sustainable water resource (quality & quantity)
- Reducing environmental impact
- Compliance with strict environmental regulations
- More cost effective and simpler configuration than building a desalination plant

ZLD Process Flow Chart

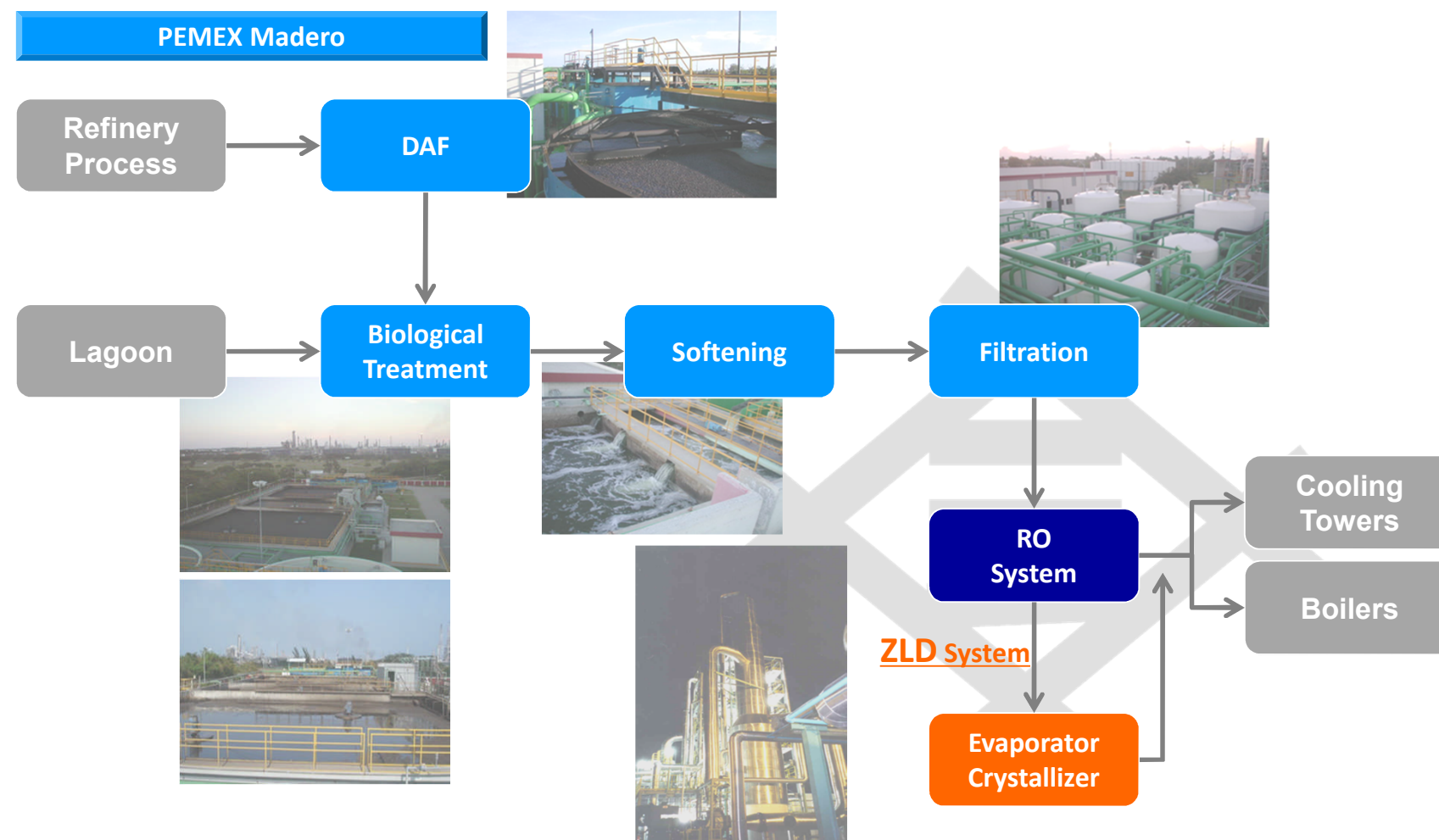
ZLD System improves the overall water recovery rate from 75 – 85% up to around 100%



ZLD Process Flow at Cadereyta

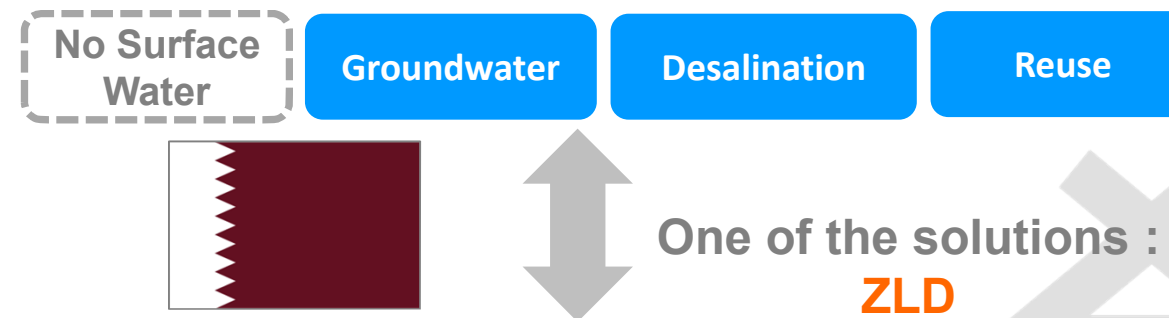


ZLD Process Flow at Madero



Conclusion

Water-related Issues in GCC countries



- Salt water intrusion to ground water
- Soil degradation
- Population increase (nearly doubled in 20 years)
- Industrialization especially utilizing substantial gas resource

Toyo-Atlatec would like to contribute to resolve your water-related problems, providing you with suitable and competitive solutions such as ZLD system.

Toyo-Atlatec Ready to Serve You!

شكراً

Thank you for your
kind attention!

ご清聴ありがとうございます。