INTERNATIONAL CONFERENCE ON DESALINATION AND SUSTAINABILITY

1 - 2 March 2012


# Jorf Lasfar: The Largest SWRO Desalination Plant in Morocco

Borja Martinez

MOR12-012

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# 1.- INTRODUCTION

## OCP Group

- World's leading exporter of phosphate rock and derivative products

## Contract

- Type of Contract — LSTK
- EPC Contractor — **CADAGUA** (Spain)

## Project Milestones

- Start of the works — June 2011
- Scheduled finish of the works — September 2013

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# 2.- THE PROJECT


## OCP's Industrial Complex at Jorf Lasfar (120 km from Casablanca)

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# 3.- DESIGN CONDITIONS

- **WATER PRODUCTION**
  - Net Capacity: 75,800 $m^3$/d (Phase I); 106,800 $m^3$/d (Phase II); 220,000 $m^3$/d (Phase III)
- **SEAWATER CONDITIONS**
  - TSS: 30 - 35 mg/l (spikes up to 40)
  - TDS: 37,000 mg/l
  - pH: 8.0
  - Operating Temperature: 13 – 23ºC

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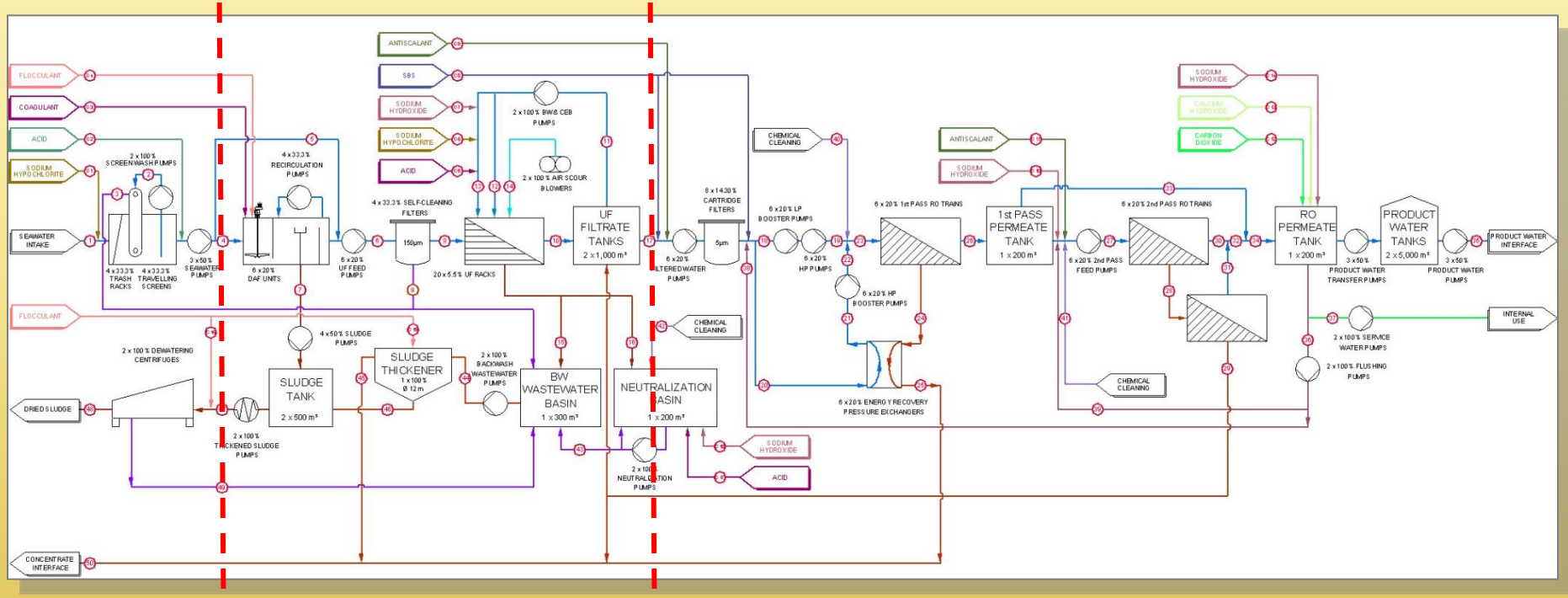
# 3.- DESIGN CONDITIONS

- **PRODUCT WATER**
  - Use of Product Water — Process & Drinking
  - Chlorides — < 200 mg/l
  - Boron — < 1 mg/l
  - LSI — +0.1 - +0.5
  - Rest of parameters according to **NM 03.7.001 Anne 2006** standard on water quality for human consumption

# 4.- PROCESS & PLANT DESCRIPTION

- **PROCESS SCHEME**




**Intake** **Pre-Treatment** **RO & Post-Treatment**

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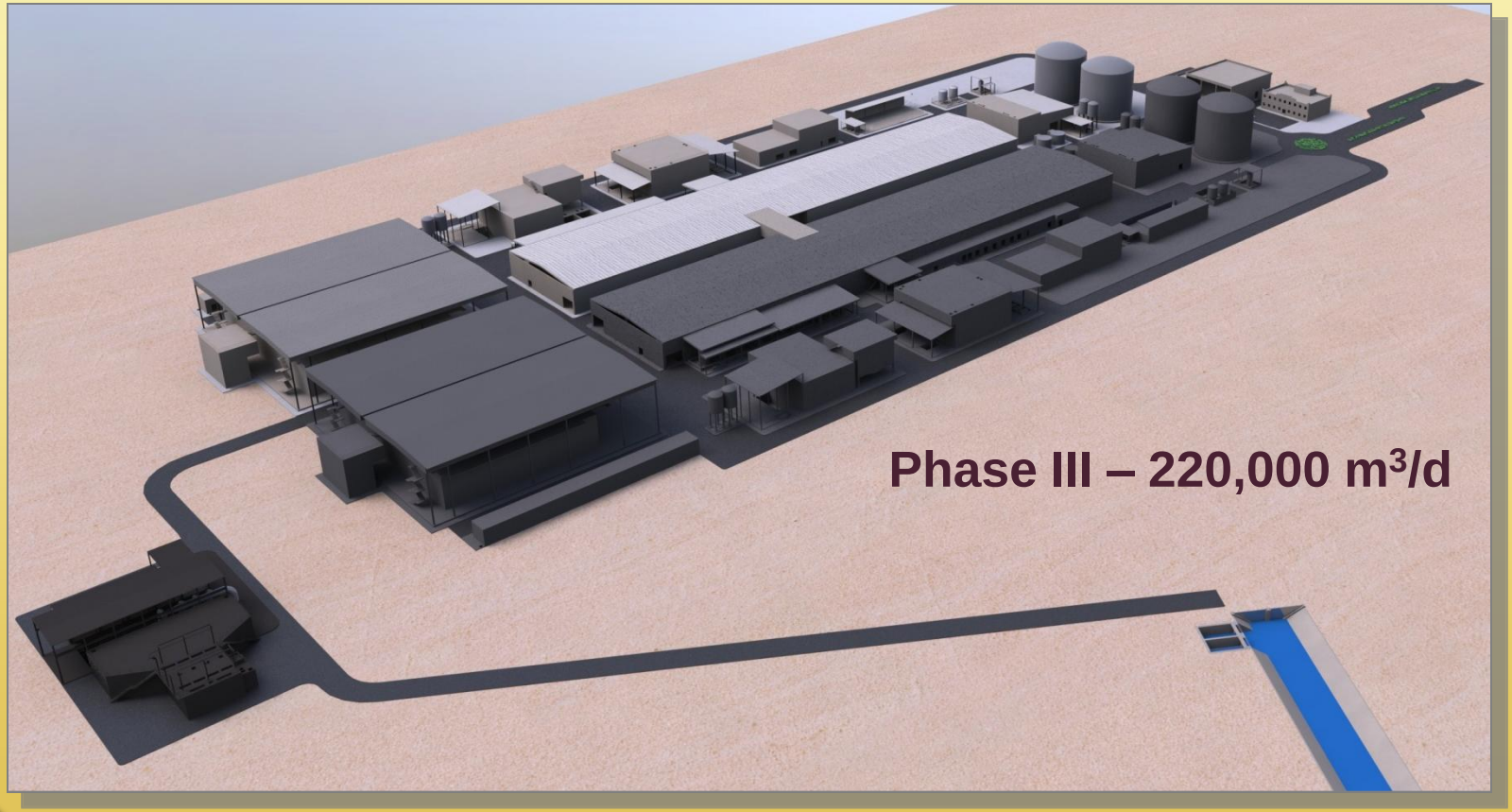
# 4.- PROCESS & PLANT DESCRIPTION

- **PLOT PLAN**

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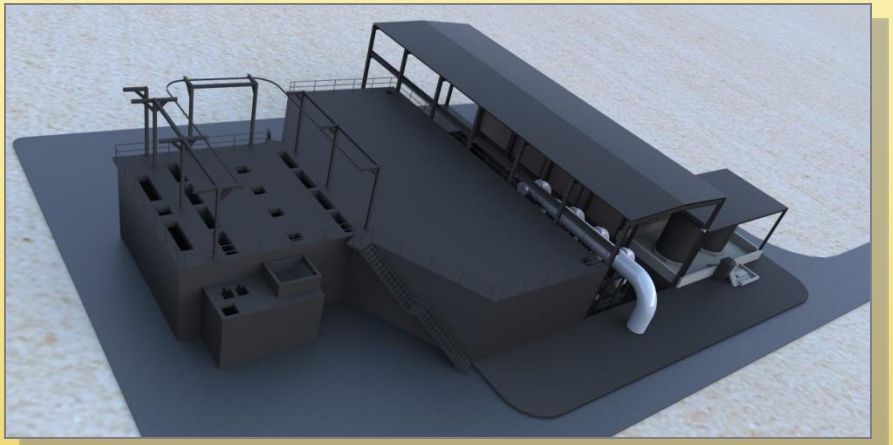
# 4.- PROCESS & PLANT DESCRIPTION

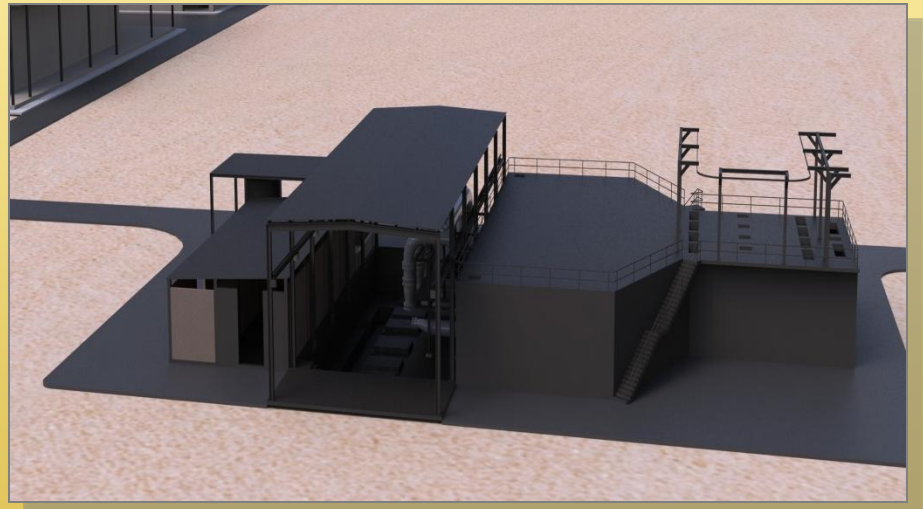
- **SEAWATER INTAKE**
  - Type of Intake — Open (existing cooling seawater channel)
  - Screening System
    - Trash Racks — 4 x 33.3% / 30 mm
    - Travelling Screens — 4 x 33.3% / 3 mm

    } Phase III
  - Seawater Intake Pumps — 3 x 50% (Phase I)

# 4.- PROCESS & PLANT DESCRIPTION

- **SEAWATER INTAKE**



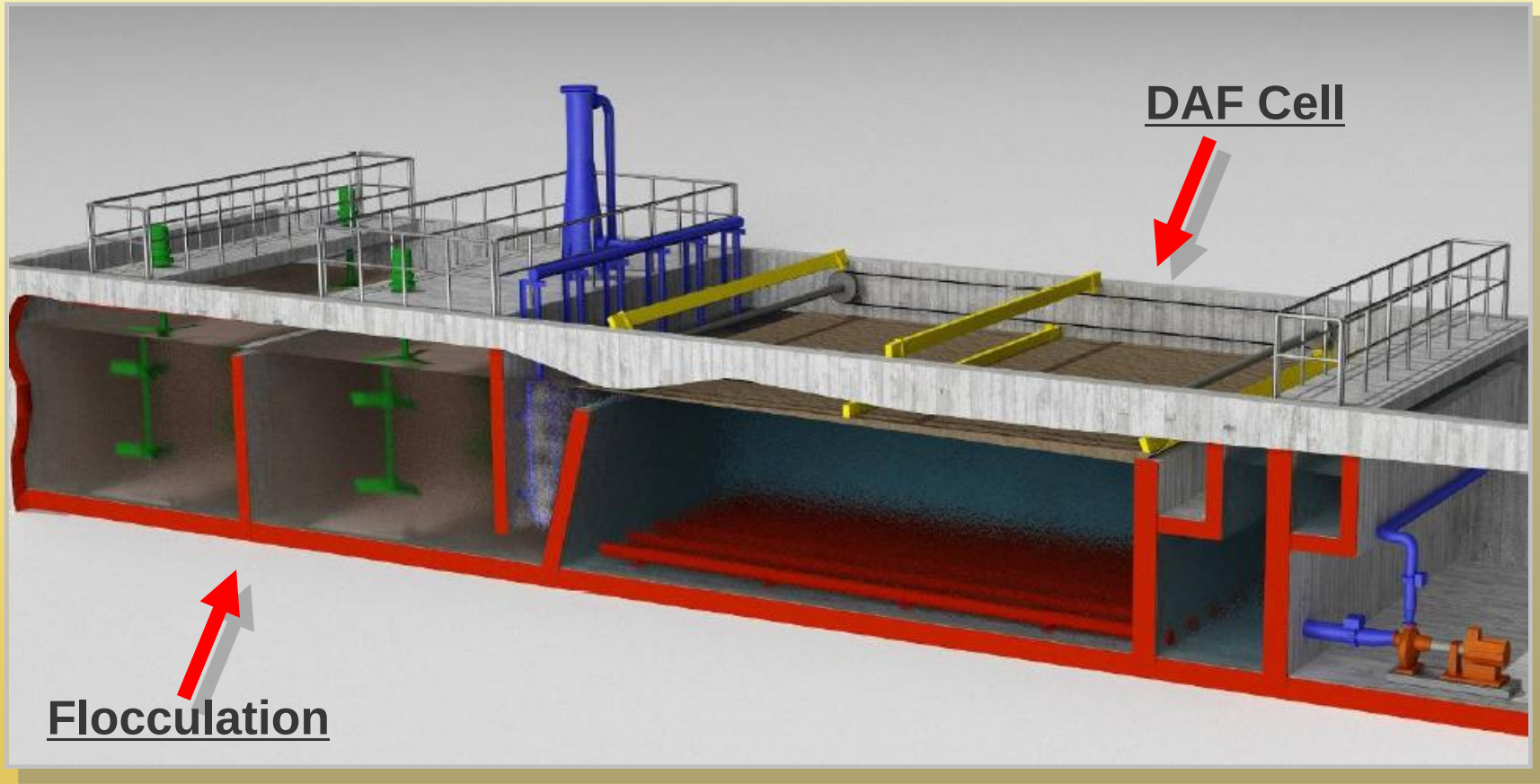


**Seawater Intake (3D-view)**

# 4.- PROCESS & PLANT DESCRIPTION

- **PRE-TREATMENT**
  - DAF System
    - In service **only** during **Harmful Algae Blooms** and/or **high level of hydrocarbons**
    - No. of lines — 6 x 20%
    - Coagulation — Static mixer - $FeCl_3$
    - Flocculation — 2 stages - Coagulant Aid
    - Flotation Cells equipped with sludge surface scrappers
    - Recycling system

# 4.- PROCESS & PLANT DESCRIPTION




**DAF Unit (typical cross section)**

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# 4.- PROCESS & PLANT DESCRIPTION

- **PRE-TREATMENT**
  - UF System
    - Required UF Permeate Quality

| | |
|---|---|
| – TSS | Undetectable |
| – Turbidity | < 1 NTU (100% of time) |
| – SDI | < 2.5 (95% of time) |
| | < 3 (100% of time) |

# 4.- PROCESS & PLANT DESCRIPTION

- **PRE-TREATMENT**
  - UF System (cont.)
    - Security Filtration — 4 x 33.3% self-cleaning filters
    - No. of UF Racks — 20 x 5.5%
    - Recovery — > 95%
    - Design Flux (net) — < 75 lmh

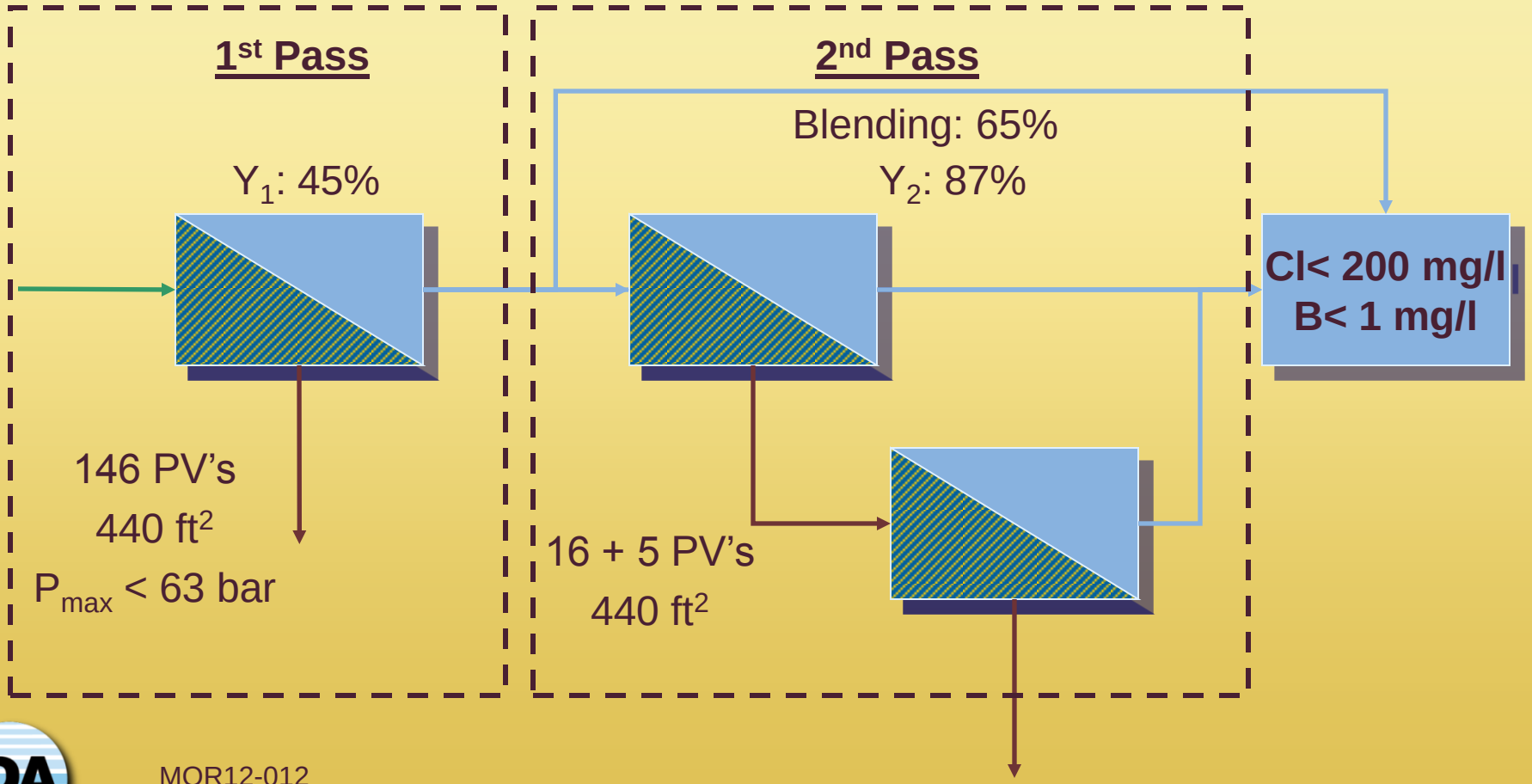
# 4.- PROCESS & PLANT DESCRIPTION

- **RO SYSTEM**
  - Permeate composition limiting parameters:
    - Cl < 200 mg/l
    - B < 1 mg/l
  - 5 years AMLT

**Double Pass Configuration**
(2nd partial pass required from 17ºC)

# 4.- PROCESS & PLANT DESCRIPTION

- **RO SYSTEM**

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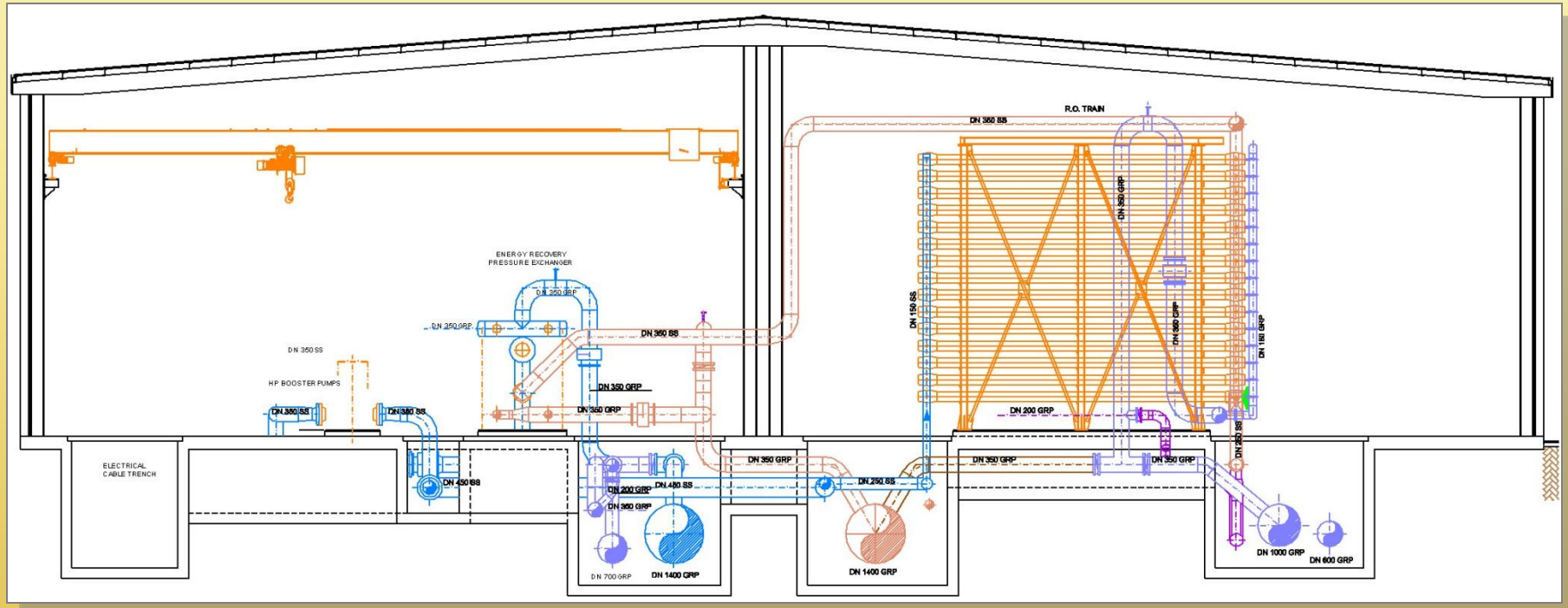
# 4.- PROCESS & PLANT DESCRIPTION

- **RO SYSTEM**
  - Cartridge Filters
    - Security Filtration 8 x 14.3% (5 µm)
  - RO Trains
    - 6 x 20% Production units (HPP + ERS + RO Racks 1st & 2nd pass) of 15,300 $m^3$/d each
    - 6 x 20% High Pressure Pumps
    - 6 x 20% Energy Recovery Systems (pressure exchangers)

# 4.- PROCESS & PLANT DESCRIPTION

- **RO SYSTEM**




**RO Building (cross section)**

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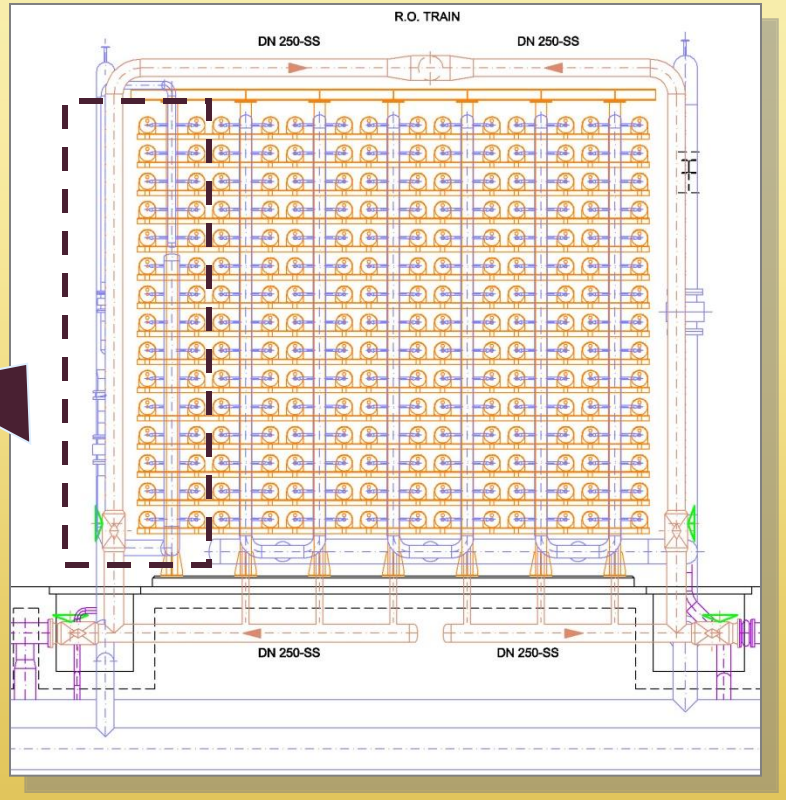
# 4.- PROCESS & PLANT DESCRIPTION

- **RO SYSTEM**

2nd Pass




Optimization of:

- Piping routes
- Footprint

**1st & 2nd Pass RO Train**

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# 4.- PROCESS & PLANT DESCRIPTION

- **POST-TREATMENT**
  - Remineralization
    - $CO_2$ dosing
    - Lime dosing
  - Product Water Pumping Station
    - 2 x 5,000 $m^3$ Product Water Tanks
    - 3 x 50% Product Water Pumps to OCP and ONEP reservoirs

# 5.- DESIGN HIGHLIGHTS

- **FACING UP HARMFUL ALGAE BLOOMS (HAB's)**
  - HAB's have become a serious problem
  - These events imply an increase of TSS and Organic Materia
  - Conventional pre-treatments are not capable of facing up to this poor feed water quality
  - Plant Availability is compromised
  - DAF will reduce up to normal conditions the seawater quality

# 5.- DESIGN HIGHLIGHTS

- **PLANT AVAILABILITY**
  - Continuous uninterrupted production of product water (100% availability)
  - Stand-by units for main process systems as:
    - DAF
    - UF trains
    - RO trains for 1st & 2nd pass (HPP+ERD+RO racks)

# 6.- CONCLUSIONS

- Jorf Lasfar SWRO Plant is the largest plant up to date under construction in Morocco

- The treatment line, and in particular the advanced pre-treatment processes (DAF+UF), leads this plant to become the most advanced SWRO Plant using latest state-of-art in pre-treatments

- The use of highest design standards in combination to high grade materials selection will lead the installation to success for a long time

# THANK YOU VERY MUCH FOR YOUR ATTENTION

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