



Essential Expertise for Water, Energy and Air

# Environmental Sustainability through the use of Nalco 3D TRASAR Technology for Sea Water Cooling tower

Water Arabia  
Bahrain Feb 2011

# Sustainability



Lasting environmental performance improvements generate economic and social benefits.

- Asset Reliability and Protection
- Production Efficiency
- Process Throughput
- Process Improvement
- Health, Safety and Env. Compliance
- Consistent cost focus

## Standards Compliance

Voluntary Mandatory / License to operate

## Resource Management

Renewable/Non-Renewable

## Financial Performance

Revenue/ Capital

# Nalco is Uniquely Positioned to Improve Sustainability



- Providing customers with solutions that are **technically, economically and environmentally sustainable** has been integral to Nalco's business offerings since our founding in 1928 and explicit in our mission for many years.
- A recent example for cooling systems:





## Sea Water Cooling Towers

- Key reasons to install a sea water cooling tower:
  - Reduce water make up and discharge flows
  - Reduce thermal discharge pollution
- Seawater cooling towers are normally operated at 1.2 – 1.6 cycles because a significant reduction of water consumption occurs in this cycle range providing important savings in pumping costs of 2-4 \$cents/m<sup>3</sup> ( based on pump efficiency, power costs, suction and discharge pressures ).



## Low Stress Causes:

- High water usage because of low cycles of concentration
  - High make-up water consumption
  - High blow-down losses
- High energy usage
  - Increased pumping costs etc
  - Larger CO<sub>2</sub> Footprint
- High treatment chemical usage
  - Compliance considerations
  - Excessive treatment costs

## Excessively High Stress Causes:

- Corrosion
- Scale
- Deposition/Fouling
- Microbiological Growth





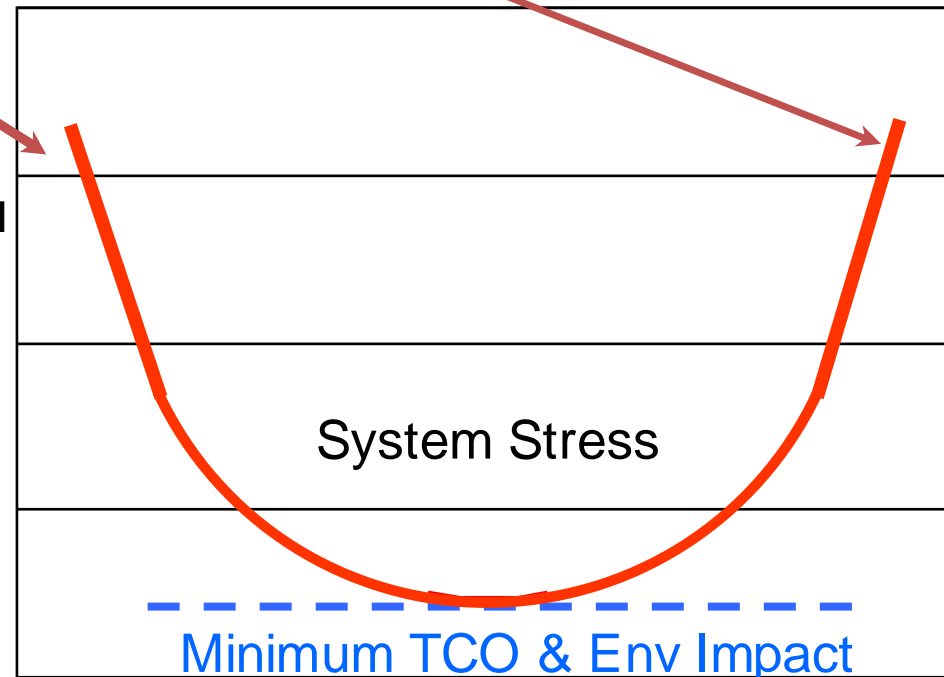
# Optimize Stress, Minimize Cost and Environmental Impact



Low Stress = high operating costs

High Stress = operational problems

Environmental Impact/Total Cost of Operation (TCO)



# Typical Operating Conditions: Sea Water Cooling Towers



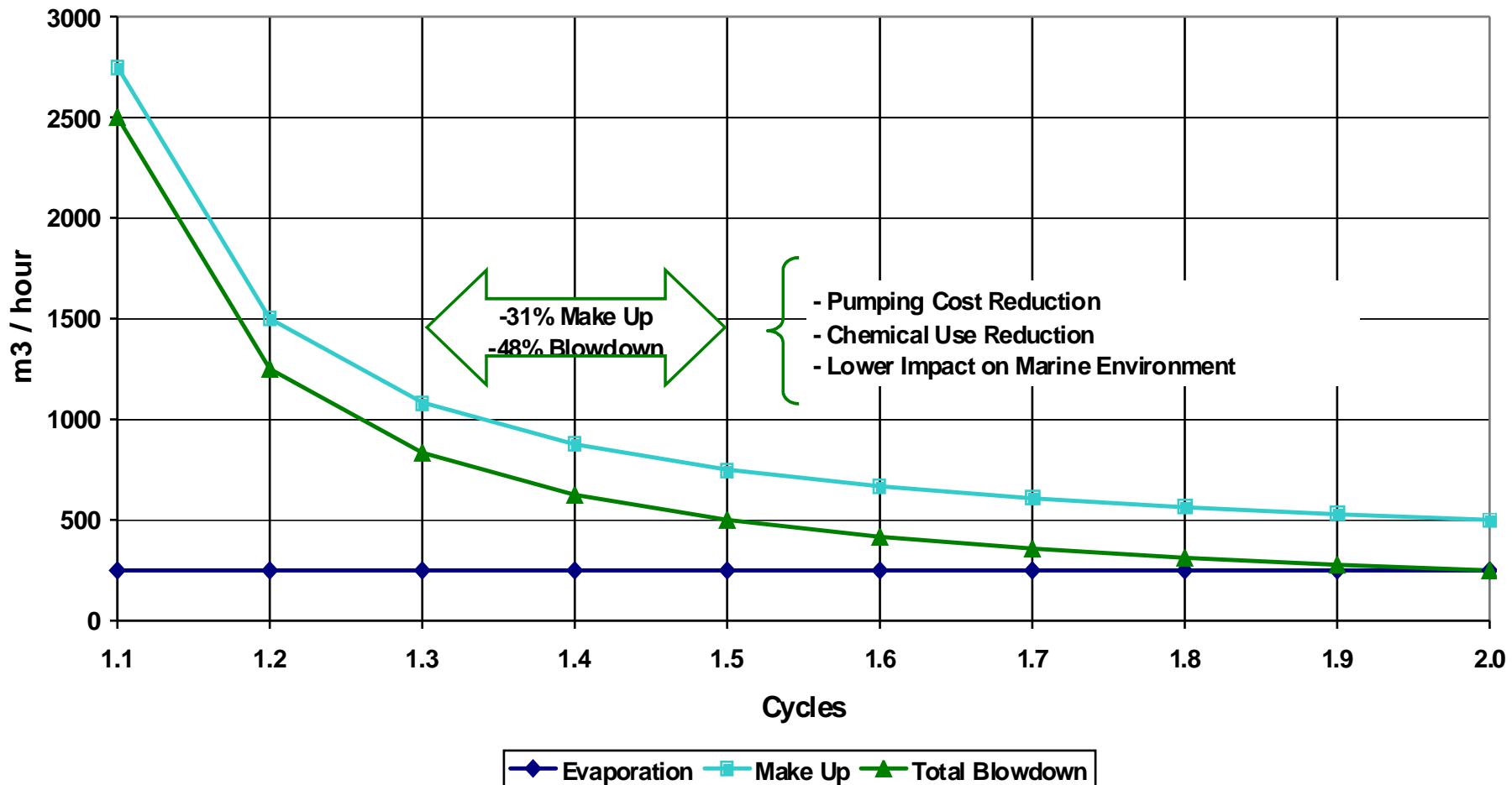
Parameter	Value	Remarks
Cycles of Concentration	1.2 – 1.6/1.7*	Operation at >1.5 requires advanced scale control
Alkalinity	200 - 225 ppm max as CaCO <sub>3</sub>	Depends on makeup alkalinity, cycles, acid feed.
Skin temperature	65°C max	Higher temp. require specific treatment to control potential precipitation of Mg(OH) <sub>2</sub> and/or CaSO <sub>4</sub>
Flow velocity	1 - 2.5 m/s	Depending on erosion resistance of the metallurgy
Reynolds number	30000-60000	Low values promote the deposition of suspended solids
Suspended solids	< 8 mg/l or < 15 mg/l	For film fill and splash fill, respectively





# System Considerations: Cycles on Water Usage

Water Usage vs. Cycles of Concentration  
for 26,850 m<sup>3</sup>/hr & 7 C Temp Rise





## Sea Water Scale

- Seawater is naturally very stable; but severe scaling problems may occur as temperature and cycles increase.
- Scale control requirements vary with the operating conditions:
  - Cycles of Concentration
  - Temperature
  - pH
  - Alkalinity
  - Water velocity
  - Suspended solids



# Predicting Scale Formation in Sea Water

- Traditional scaling indices do not apply to sea water.
- Nalco Research developed a new application model for seawater scale inhibition.
  - Accurate calculations of scale saturation indices.
  - Calculation of inhibitor dose requirements based on research testing and field experience.



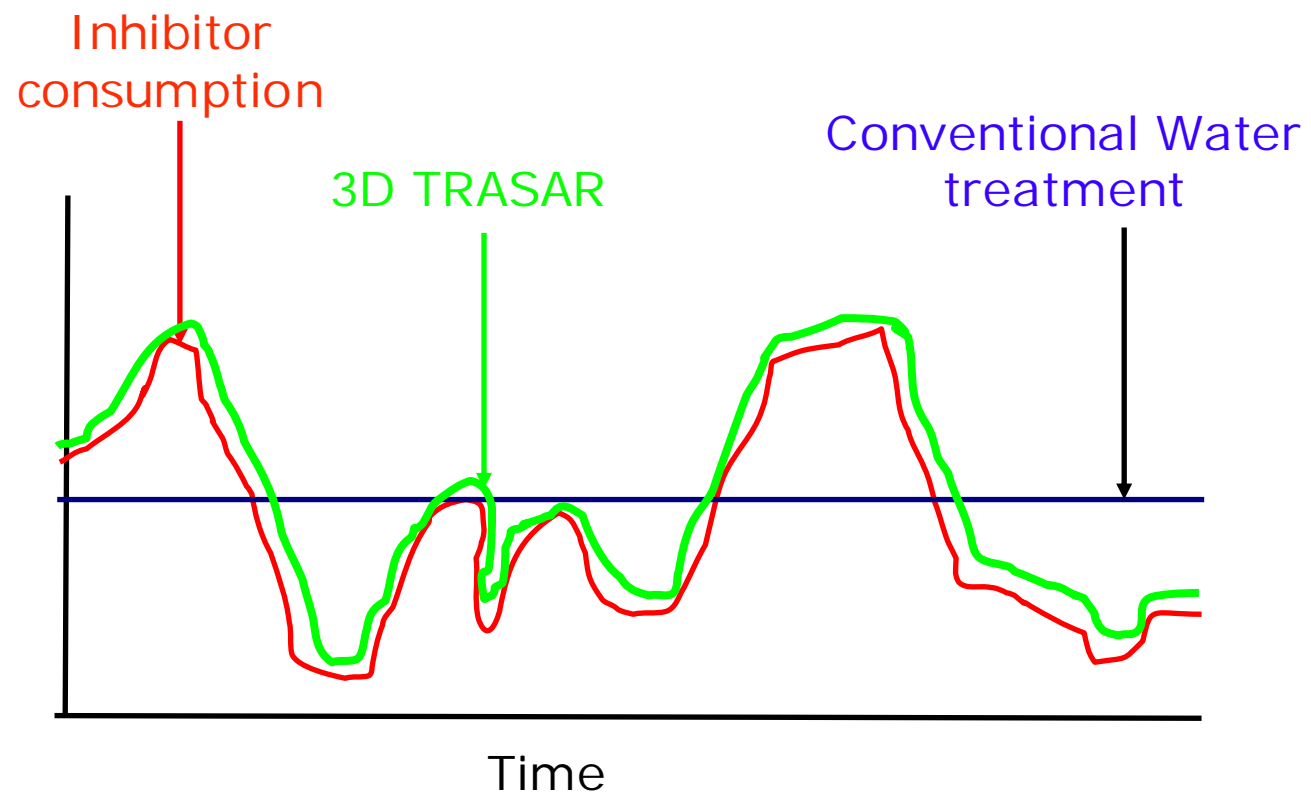
# Scale Inhibitor Automation & Control

- Sea water recirculating cooling system operate with high blow down rate and low cycles
- Scale inhibitor is applied at a very low dosage
  - 0.5 – 5 ppm as product / Make up
- An automated control system is needed to assure the right amount of scale inhibitor is fed into the system while maintaining the optimum cycles of concentration
  - 3D Trasar<sup>®</sup> system enables treatment on demand
  - 3D Trasar<sup>®</sup> system provides continuous on line analyses of water parameters
  - 3D Trasar<sup>®</sup> automatically follow changes in load



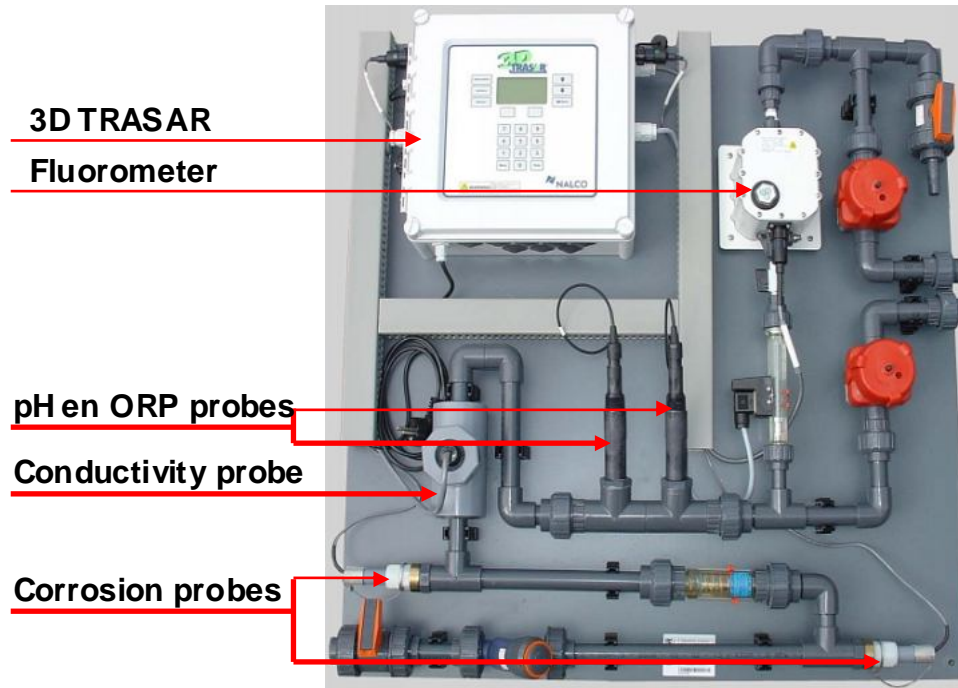
# Scale control Management

Continuous measurement of the inhibitor level, and control of the injection.



# 3D TRASAR

## Measured and logged parameters:



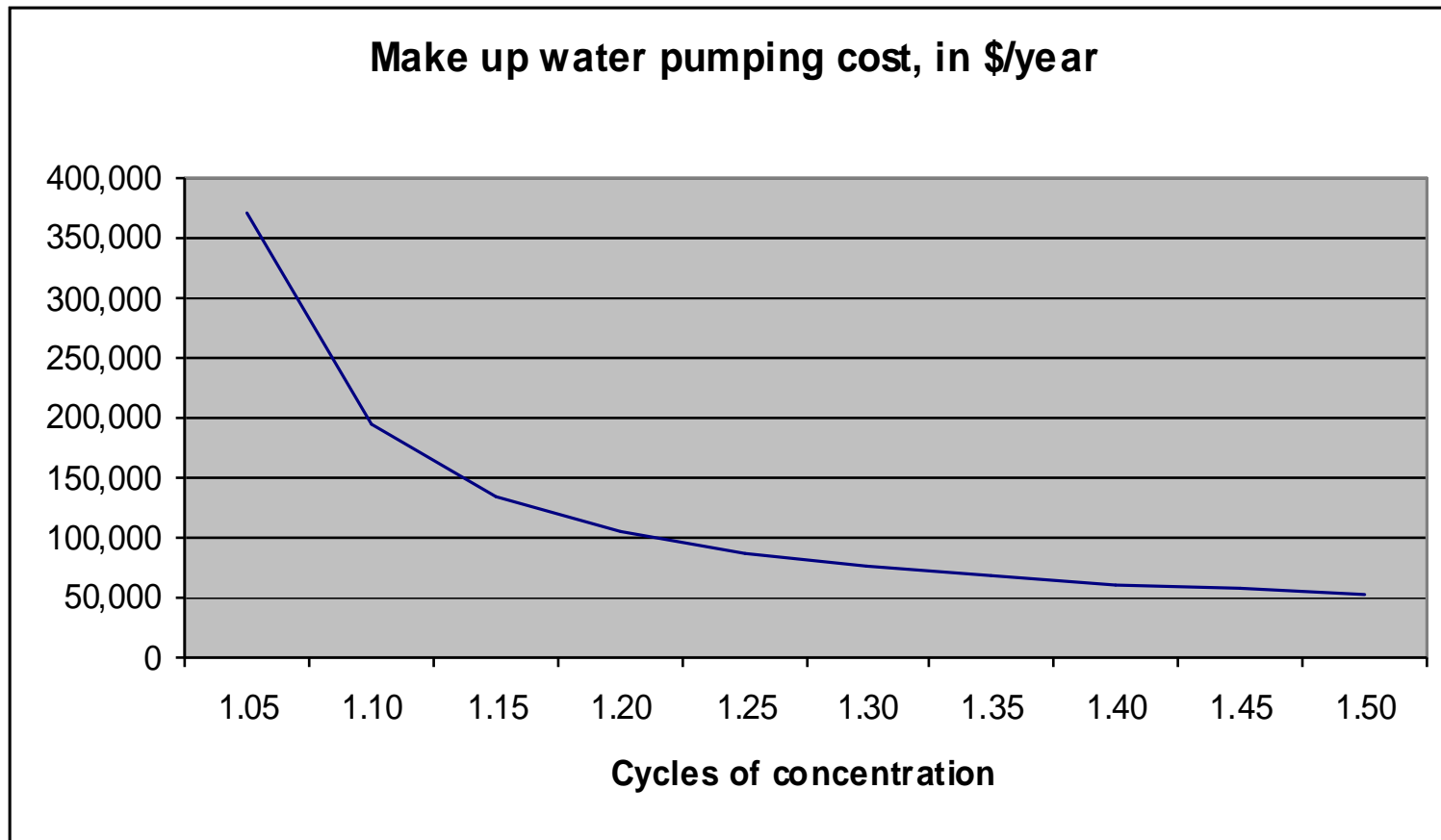
- pH
- ORP
- Conductivity
- Corrosion rate Steel and Copper
- Temperature
- Turbidity
- Inert Trasar (Total dosed product)
- Fouling fluorometer
- 4 x 4-20 external mA signal

All parameters can be transferred on line to any computer, desk top, lap top or mobile phone via land line or satellite communications for constant and instant monitoring and alert messages





## Example: 10,000 m<sup>3</sup>/h recirculation rate and 5 deg C delta T cooling tower





# 3DTrasar on Sea Water Cooling Towers

By providing constant, accurate and online monitoring and control of the inhibitor levels in the Sea Water, 3DTrasar generates important savings in energy and chemicals consumptions while maintaining the integrity of the system.