

# Water and Energy Nexus in Industrial Plants

*April 24<sup>th</sup>, 2013*

**Dr. Narasimha M. Rao**  
VP, RD&E and Automation  
Global Water, F&B, and Textile Care  
Ecolab

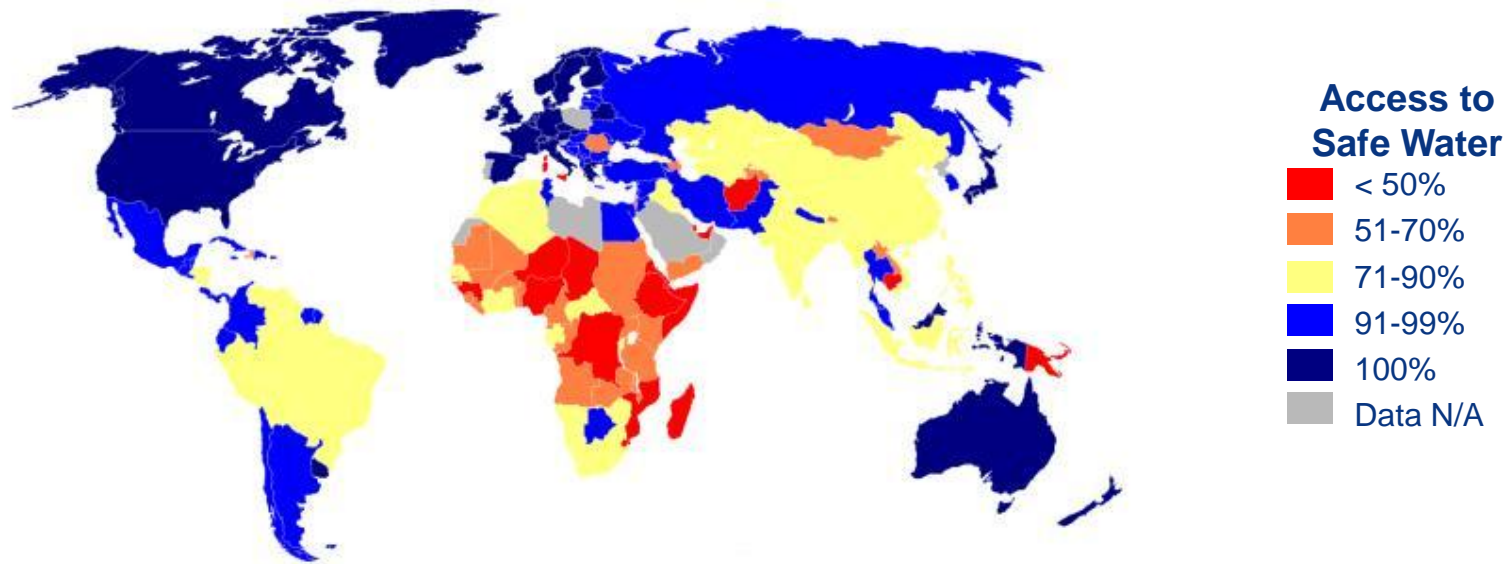
# Agenda

- Market drivers and trends
- Water and Energy Nexus
- Water treatment fundamentals
- Water Energy Nexus examples
  - Hotel
  - Bottling Plant
  - Energy production (Oil Sands)
- Summary

# Market Drivers and Trends

- ▲ Trend towards Water conservation
  - Shortage of water (BRIC+)
  - Regulatory pressures
  - Brand image (Sustainability)
- ▲ Reuse and recycle and worsening water quality (e.g. Sea Water, municipal waste water)
- ▲ More stringent view on chemistries
  - Limits on Specific contaminants (e.g. P)
  - Preference to use “non-chemical solutions” (Europe)
  - Increasing acceptance of “gadgets” (Light markets)
- ▲ Lack of qualified labor
- ▲ Need for reliable, actionable information
  - Increasing acceptance of the internet and remote monitoring

# Water A Key Issue in Fastest-growing Economies



*Water quality and quantity are driving important market trends...*

- 7 Billion People today, up to **10 Billion by 2050**
- Improving quality of life requires more **resource-intensive foods**
- Today, **1 Billion** people lack access to **clean water**
- **Energy** demand will rise nearly **40% by 2035**

# OUR CUSTOMERS FOCUSING ON SUSTAINABILITY

Public customer data shows demand for solutions to sustainability goals

	Has a Sustainability leader	Stated Water Goal	Stated Energy Goal	Stated GHG goal	Stated Safety Goal	Stated Waste Goal
Percent of customers	87%	53%	55%	40%	9%	34%

Including ambitious Targets:



Become Water Neutral



Grow business with nearly half the footprint (water, energy, waste)



> 20% reduction in water or energy

# SUSTAINABILITY CORE TO OUR PURPOSE



We are the global leader in water, hygiene, and energy technology and services.

We have an exponential impact on the sustainability of our planet.

▲ **22,500** sales and service professionals

▲ in **171** countries

▲ delivering innovative programmes and services (**5,300 patents**)

▲ at over **1 million** customers locations

# Water & Energy are Interdependent

---



## Water needs for Energy

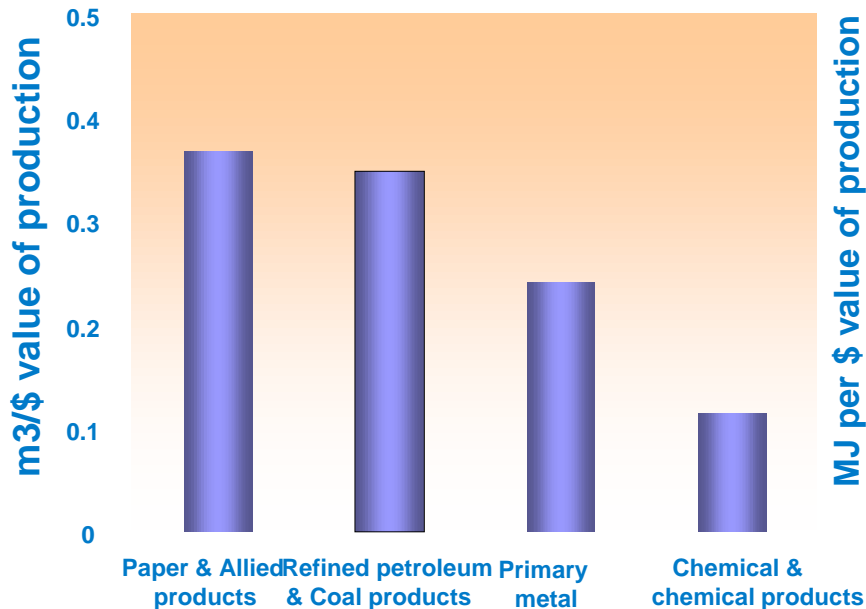
- Thermoelectric cooling
- Hydropower
- Energy resources extraction
- Fuel production
- Emission management

## Energy needs for Water

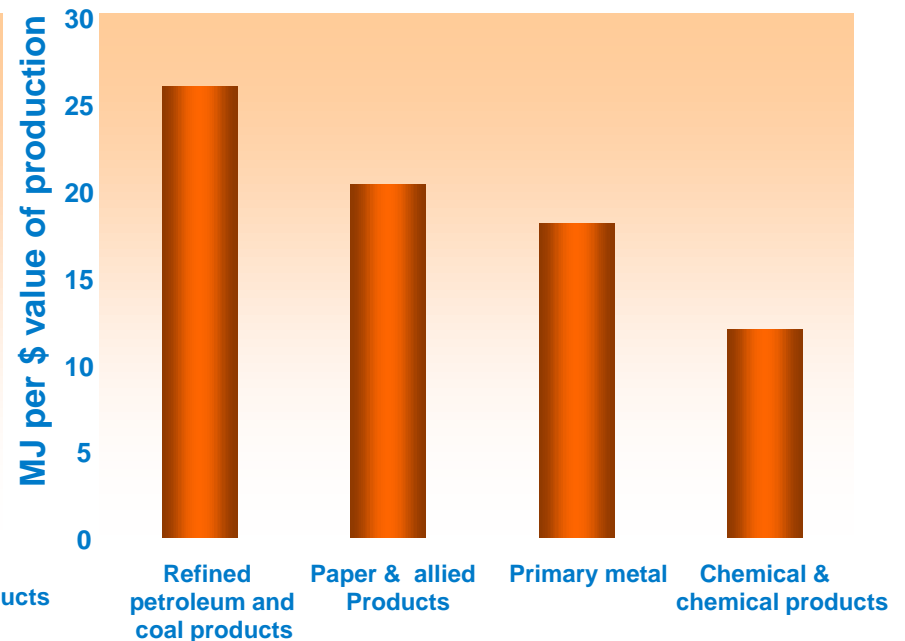
- Treatment
- Conditioning for use
- Transport & conveyance
- Production (eg desalination)
- Pumping

# Energy and Water Usage

## Economic Intensity of Water Usage



## Economic Intensity of Energy Usage



**Several major industries are large consumers of both water and energy in the manufacturing sector: Water is the medium of choice for heat transfer in industry**

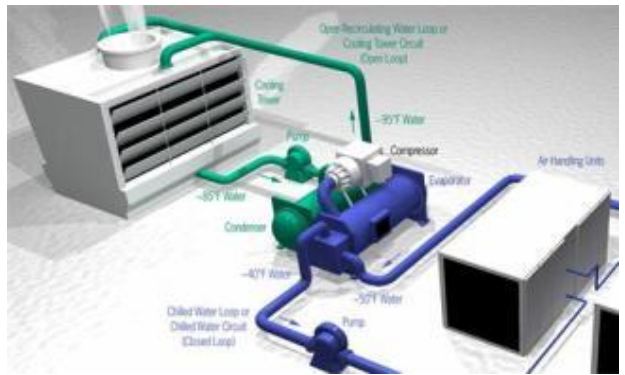


# Water Treatment in industry

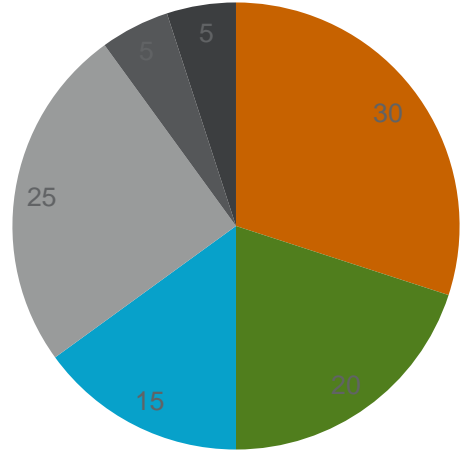


# 300 Room Hotel Water & Energy Consumption

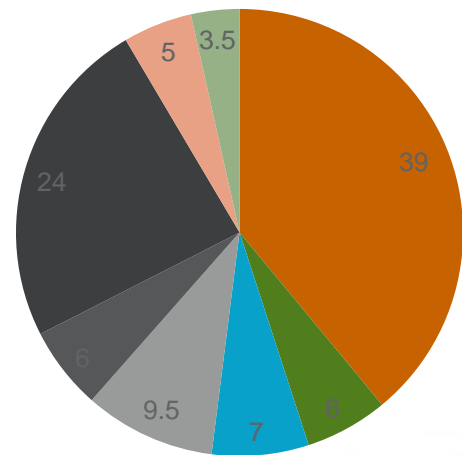
### Water



### Energy

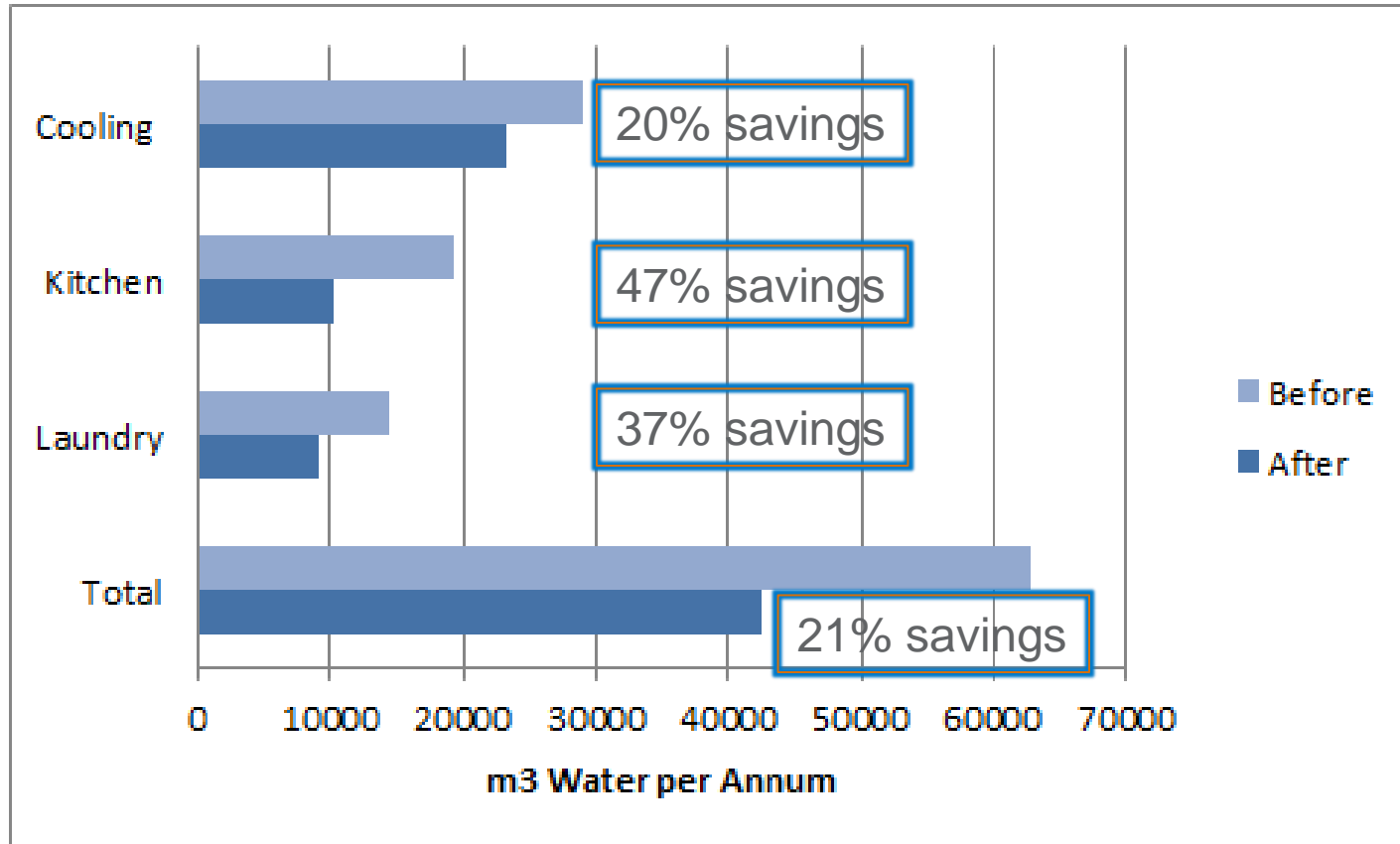


- Cooling
- Kitchen & Public Areas
- Laundry
- Guest Rooms
- Hot Water
- Other

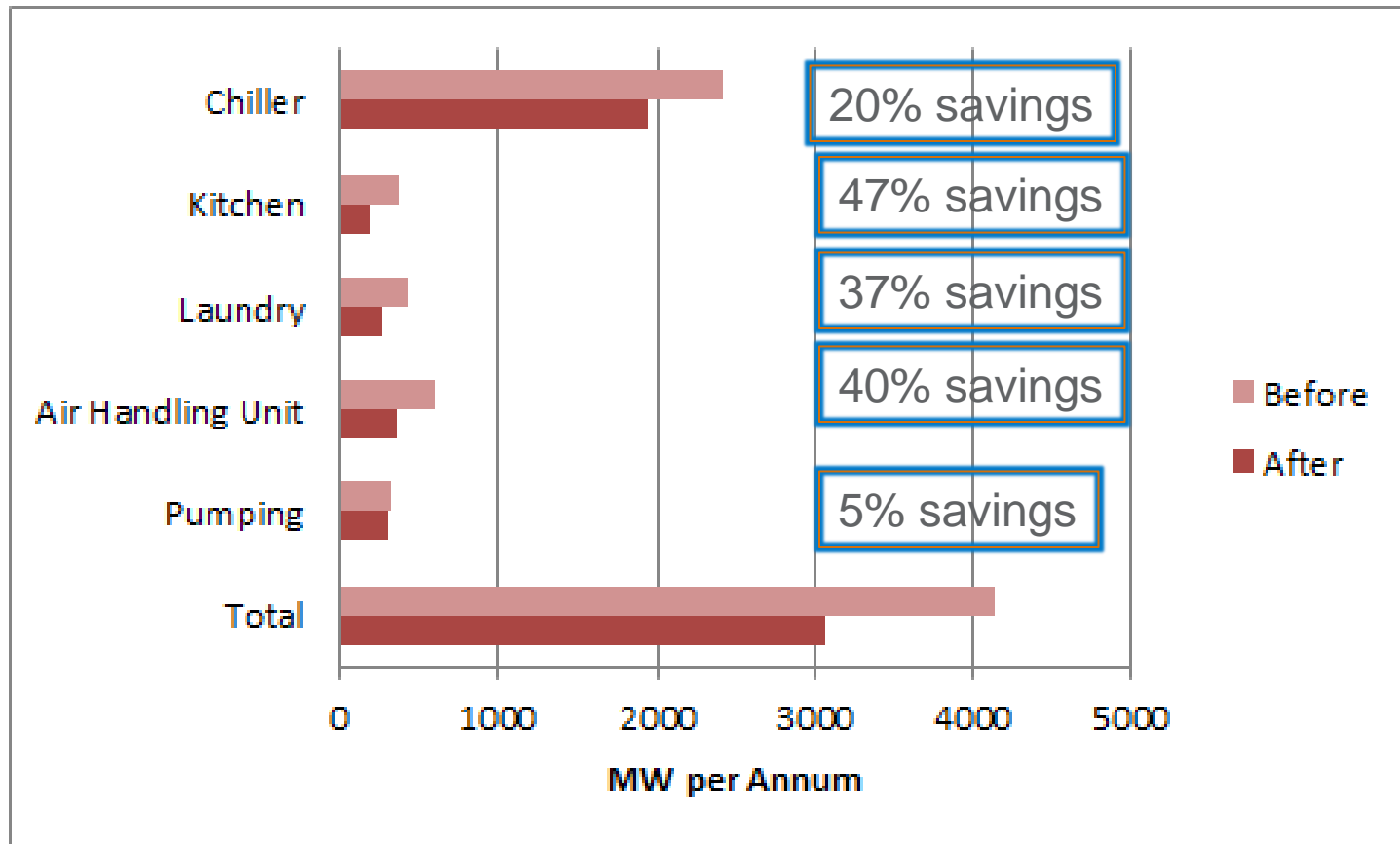


- Chiller
- Kitchen
- Laundry
- Air Handling Unit
- Hot Water
- Lighting
- Pumping
- Other

# 300 Room Hotel Before & After Water Usage Optimization



# 300 Room Hotel Before & After Energy Usage Optimization



# New Apex Conveyor Ware Washing Program: Superior Performance with Water and Energy Savings



## Products

- Solid products are safe and easy to use
- Non-corrosive chemistry to minimize the risk of chemical injury
- Low phosphate and phosphorus formulas for excellent results

## Automation and Reporting

- Reliability and efficiency
- Easily identifies areas to improve operational efficiency
- Delivers best possible at lowest total cost

**World Class On-site service**

Traditional



**Better Results**

Apex Conveyor



Traditional



**45% Total Savings**

Apex Conveyor



Traditional



**24% Electrical Reduction**

Apex Conveyor



Traditional



**87% Natural Gas Reduction**

Apex Conveyor



# Aquanomic Laundry Program Delivers Superior Performance with Water and Energy Savings

- Innovative Low Temp Chemistry and Smart Wash Process
- Unique blend of surfactants
- Formulated for the environment



- 40% reduction in water usage
  - 50% reduction in energy usage
  - Optimized wash formulation
- .....

## Delivering Results

- Clean, white & soft linens
- Right pH balance
- Does not compromise linen life

# 3D TRASAR Technology for Cooling Water Enables Water Savings While Delivering Superior, Consistent Cooling Performance

## Detect



Scale



Corrosion



Microbiology



Alarms on System Upsets

- Real-time scale and corrosion measurement with fluorescent Tagged Polymer and proprietary Nalco Corrosion Monitor and Nalco Deposit Monitor
- Direct measurement of bio-demand with bio-reporter technology
- Other system conditions monitored through conductivity, pH, ORP, temperature, and turbidity
- Alarm conditions are reported instantly via email

## Determine



Special Algorithms



**NSI  
NBI**



Root Cause & Actions

- Built-in control algorithms determine chemical dosage and blow down response
- Proprietary dynamic algorithms based on Nalco Scale Index and Nalco Bio-Index respond to variable stresses
- Remote monitoring by the Nalco 360 Expert Center enables proactive response to system conditions

## Deliver



Asset Longevity

Corrosion control



Energy Savings

Fouling prevention maximizes heat transfer efficiency



Water Savings

Higher cycles minimizes water discharge



Expert Support

Experts watch your systems 24/7 for your peace of mind





# Water and Energy Optimization in a Chemical Plant Using 3D TRASAR



## Water and Energy Cost Savings



**Plant:** Urea Ammonium Nitrate (UAN) Chemical Plant  
**Region:** North America

### Situation:

- Large multi-cell cooling towers and several key heat exchangers had heavy scale buildup.
- Cooling Tower fouled with Nitrifying Bacteria

**Application:** 3D TRASAR® Cooling Water Integrated Solution

### eROI Benefits:

- \$402,785 Energy Savings by Improved Heat Transfer
- 95,439MMBtu in Natural Gas Reduction
- 5,695 Tons of CO2 Emissions Reduced
- \$1.8MM in Increased Production
- \$60,000 in reduced maintenance cost

The Nalco logo, featuring a stylized 'N' and the word 'NALCO' in a sans-serif font, with 'An Ecolab Company' written in smaller text below it.

3D TRASAR® technology

The Green Chemistry Challenge Award logo, featuring a green flask with a leaf and the text '2009 PRESIDENTIAL GREEN CHEMISTRY CHALLENGE AWARD WINNER'.

Saved 87 billion gallons (329 million cubic meters) of water for Nalco customers in 2010

# Some Examples of Opportunities for Water and Energy Savings in Food and Beverage Applications

# Ecolab's Bottle Washing Programs Save Water and Energy While Delivering Superior, Consistent Results



Low Temp  
Cleaning  
Chemistry



Automation  
and  
reporting



Bottle  
Coating



World  
Class  
Service

## Impact and Savings in a Typical plant

<b>Energy Savings</b>	\$79,845
<b>Water Savings</b>	\$14,400
<b>Caustic Savings</b>	\$28,603

Cost  
optimization

Sustainability  
Water and  
Energy

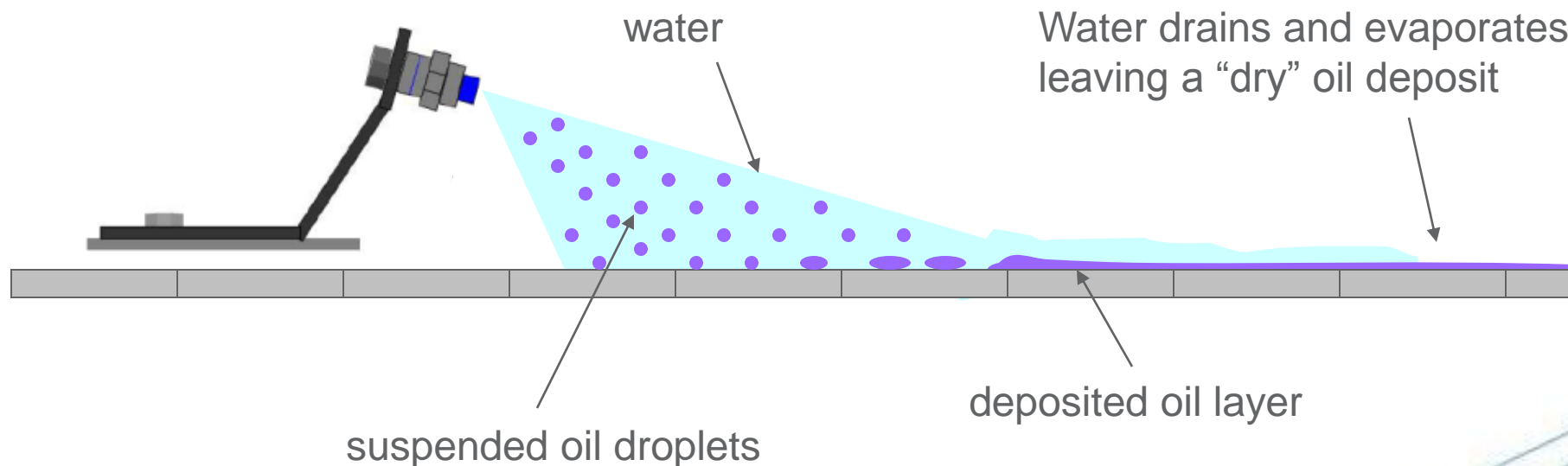
Soil removal

Bottle Life  
extension

Food safety

ACL  
conservation

# Ecolab's DryExx™ Lubricants Deliver Superior Performance While Saving Water



## ▲ Customer benefits

- Reduced water consumption
- Cleaner drier safer plant
- Drip pans not required
- Less pressure on water effluent
- Better lubrication – higher production rate
- No phosphorous

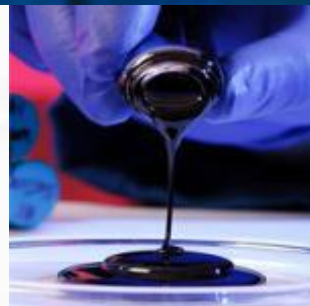
## ▲ Example Going from wet to dry lubricants

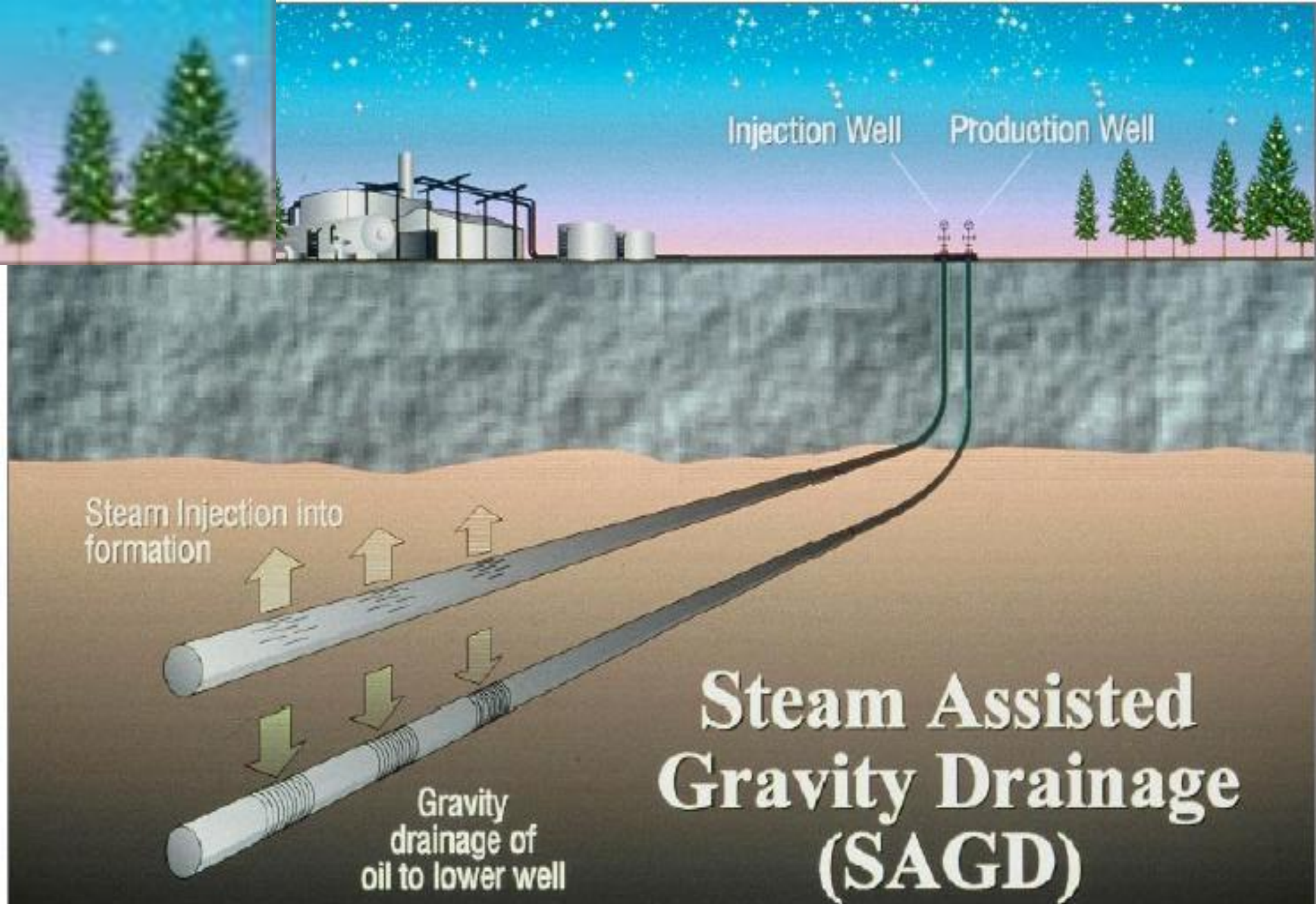
- 400,000 gal/year water savings
- 50 fold reduction in chemical use

# Oil Sands: Water and Energy Nexus

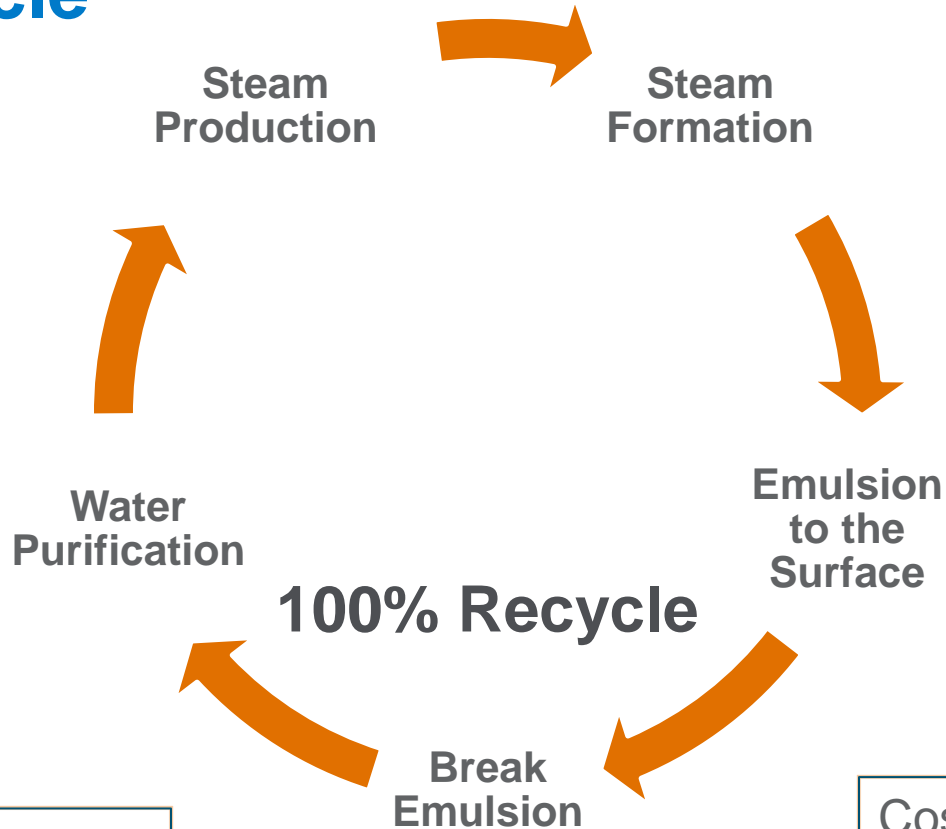
# Oil Sands-what and where is it?

- ▲ Deposits of bitumen found in more than 70 countries
- ▲ The bulk of the oil sands is found in northern Alberta and concentrated in 3 Major Reserves:
  - Athabasca-Wabasha
  - Cold Lake
  - Peace River
- ▲ Proven Oil Reserves of 175BB barrels, making it second only to Saudi Arabia
- ▲ An estimated to 2 trillion bbl still in the ground.
- ▲ Oil Sand Content:
  - 10-12% oil
  - 80-85% clay, sand, minerals
  - 4-6% water
  - Bitumen is high in carbon but low in hydrogen and must be upgraded to form a light synthetic crude





Source: U.S. Department of Energy



- 0.2-0.5 m<sup>3</sup> (50-135 gal) water to produce 1 barrel of bitumen
- Water is treated and sent back to the boilers to produce the steam. Water quality is poor.

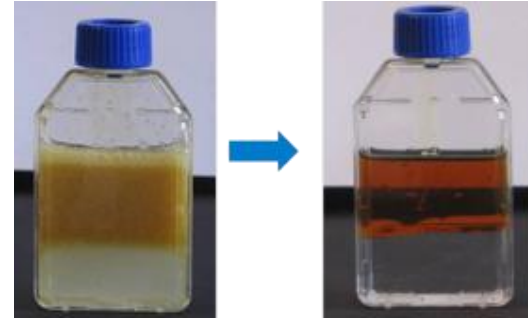
Cost to produce 1 barrel of oil

- Saudi Arabia/Iraq <\$1/barrel
- United States \$5-6/barrel
- Canadian Oil Sands: *In* > \$17-22

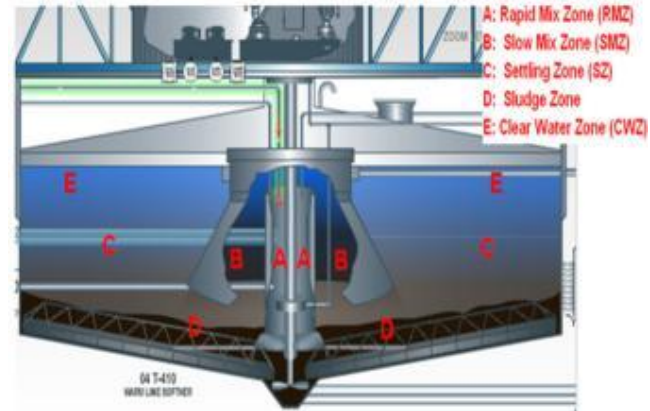


# Nalco Assists Our Customers in Three Main Ways

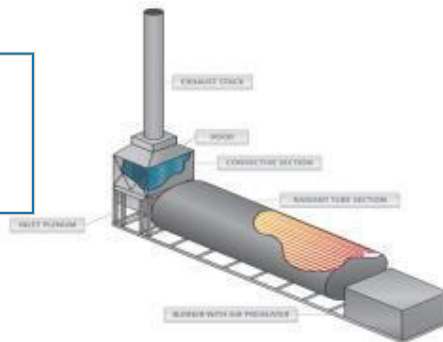
**Emulsion Breaking for efficient separation of oil from water**



**Water Treatment to remove oils and problem ions for downstream processing in boilers**



**Reliable Steam Production**



Scale Control



Corrosion control

# Summary

- ▲ Market trends demand innovative solutions for efficient water and energy management
- ▲ Water and Energy are intricately intertwined in industrial plants
  - Best practices for water management will result in good energy management
- ▲ Opportunity exists for more efficient water and energy management through innovative solutions