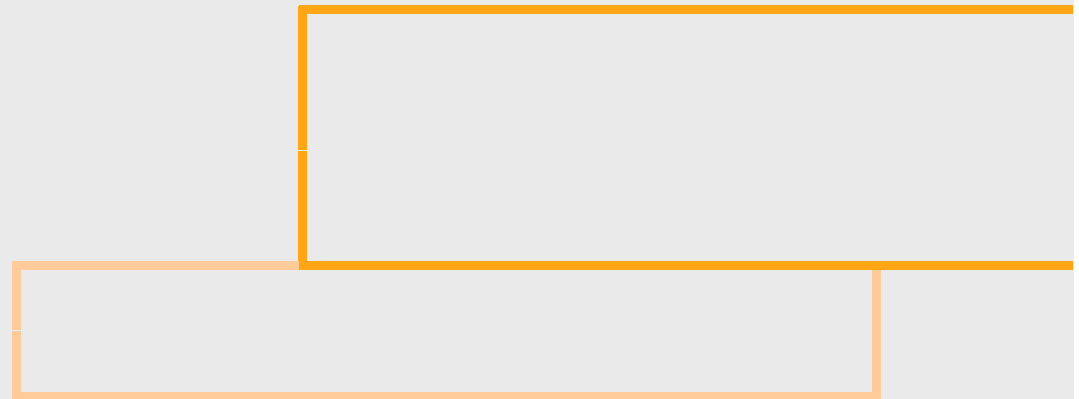




**ITT**

**Intelligent Energy**

**Wastewater Treatment**



*Engineered for life*

# Tony Scowen – Business Development Director Middle East

- Presentation Format

- Brief introduction to ITT
- Overview of Municipal Wastewater Treatment
- Considerations for Energy Reduction
- Process and Product Development
- Consideration of “Life Cycle Costs”
- Product Recovery and Reuse

# ITT Corporation Today

## DEFENSE ELECTRONICS & SERVICES



Supplier of military defense systems and advanced technical and operational services

2007 Rev. \$4.14B

## FLUID TECHNOLOGY



World's largest supplier of pumps and systems to transport, control and treat water and other fluids

2007 Rev. \$3.51B

## MOTION & FLOW CONTROL



Component producer for the transportation, marine, industrial and aerospace markets

2007 Rev. \$1.35B

# ITT Fluid Technology

The world's largest provider of water and wastewater treatment equipment for the following markets:

Water and  
Wastewater



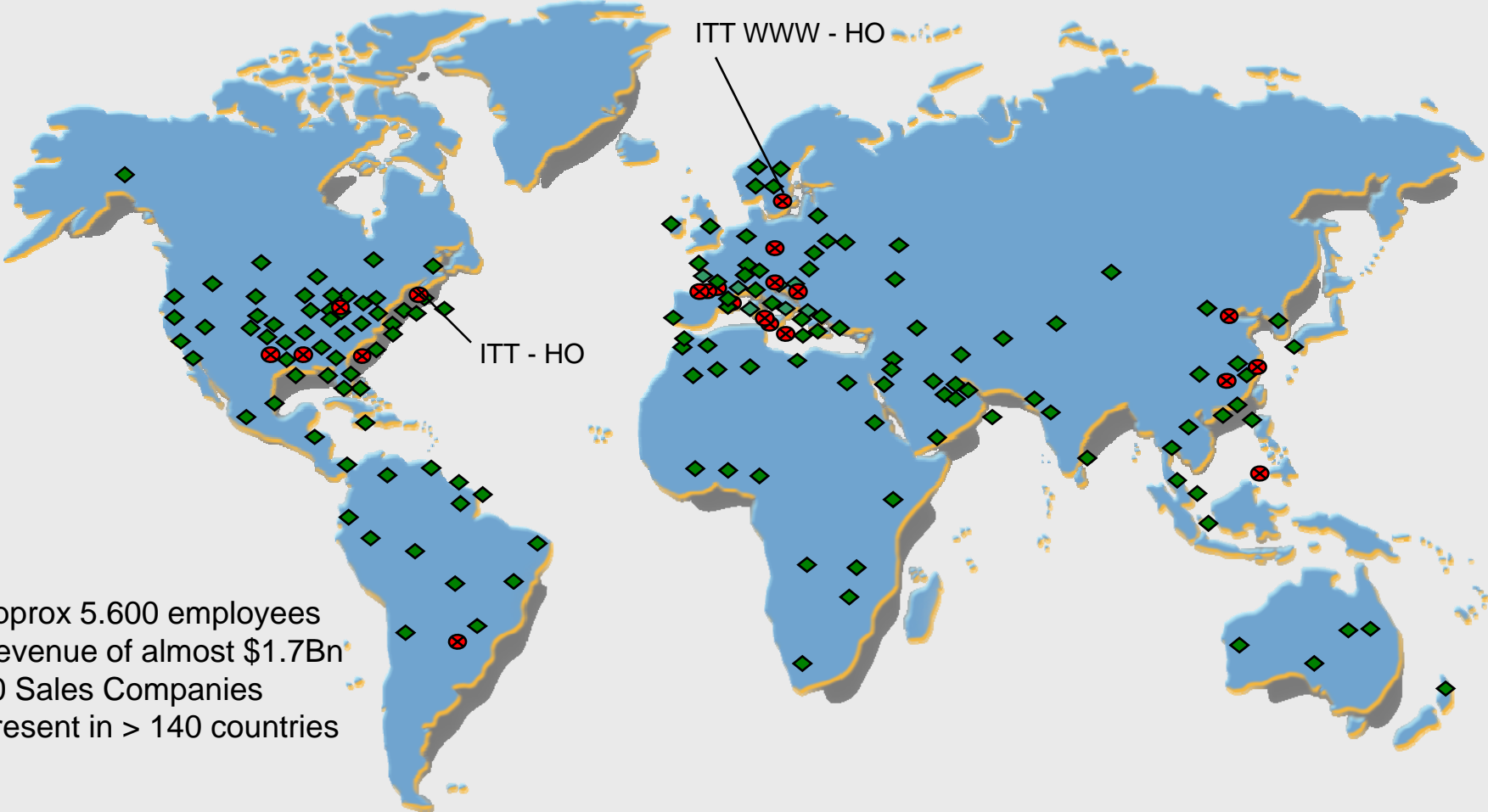
Industrial  
Process




Residential and  
Commercial Water




# ITT Water & Wastewater - Global Presence



Approx 5.600 employees  
Revenue of almost \$1.7Bn  
70 Sales Companies  
Present in > 140 countries

 Manufacturing Facilities

 Customer Service Centers/Distribution/Sales Offices



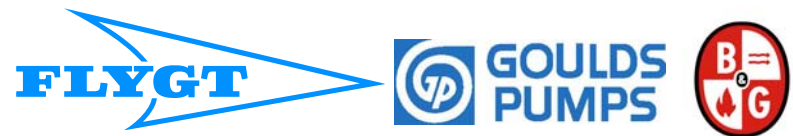
# ITT Water & Wastewater

*Pump, control and treat Fluids – Everywhere*

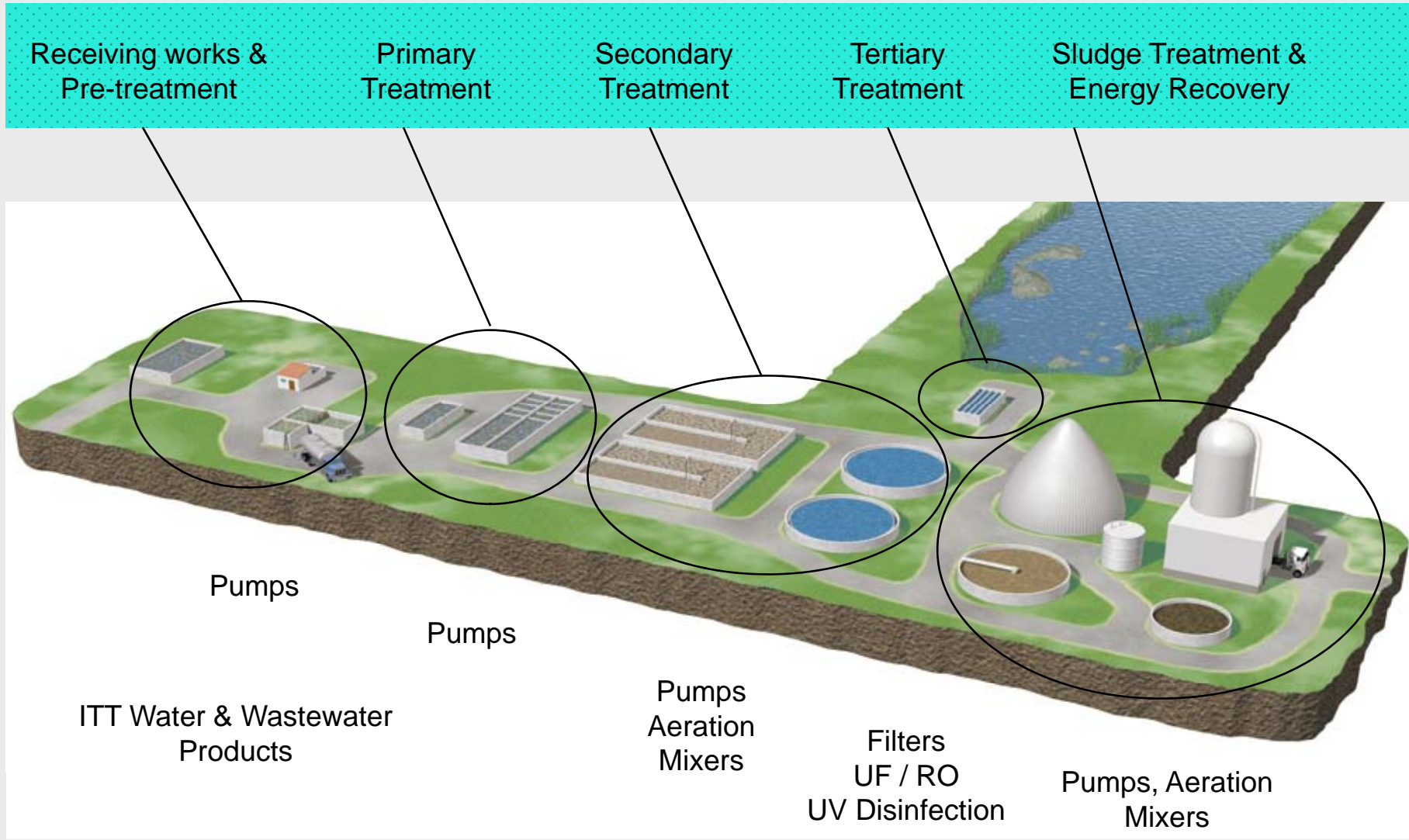
Water & Wastewater  
Transport

Water & Wastewater  
Treatment

Dewatering



# Conventional Wastewater Treatment Plant



# Where are the energy costs in Wastewater Treatment

- Sewerage Network and on-site Pumping
  - Including offsite pumping stations and on site intermediate and recirculation pumps
- Aeration to biological treatment stage
  - Supplying air to the aeration basins can account for 70% of the total energy costs
- Sludge Treatment
  - Chemicals and power used in sludge dewatering
  - Heat used in the digesters
- Sludge disposal
  - Transport for the disposal of the sludge to land or to a centralised treatment centre
- Recoverable Energy
  - Up to 30% of the total energy costs for the site could be recovered through a CHP plant running on the gas produced by the digesters

# Considerations for Energy /Carbon Reduction

- Life Cycle Costs (LCC)
  - Total cost of installing and operating a plant over it's designed lifetime
- Product Development
  - Product development under EuP (Energy using Products) legislation can save typically < 5% on energy
- System Engineering
  - System Engineering applied to the overall process can save < 30% on energy
- Condition monitoring
  - The status of key items of equipment can be continuously monitored to facilitate timely maintenance, maximise reliability and reduce costs
    - Flygt monitoring and status (MAS) system
- Control
  - Use of automated control systems can greatly enhance the operation and reliability of a system resulting in significant energy savings
    - “PumpSmart” uses a “smart” VFD controller and proprietary control software to provide advanced process control, enhanced reliability through failure prevention, reduced life cycle costs and significantly lower energy costs - up to 65%.

# Further ways to reduce Energy /Carbon Emissions

- Select the optimum process based on LCC
  - The key to an energy efficient treatment plant
- Select the best equipment
  - For reliability and efficiency
- Carry out recommended & preventative maintenance
  - Often reduced to save on labour costs
- Consider the sludge disposal route
  - Local treatment and discharge to land
  - Centralised treatment
  - Transport costs - often a significant portion of the operating costs
- Increase automation

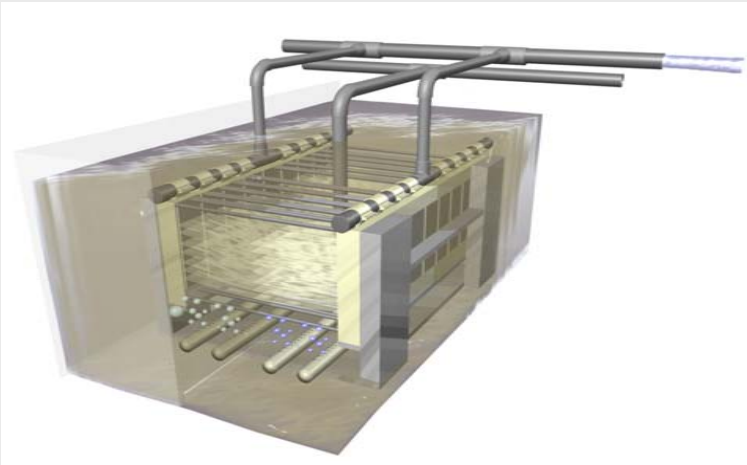
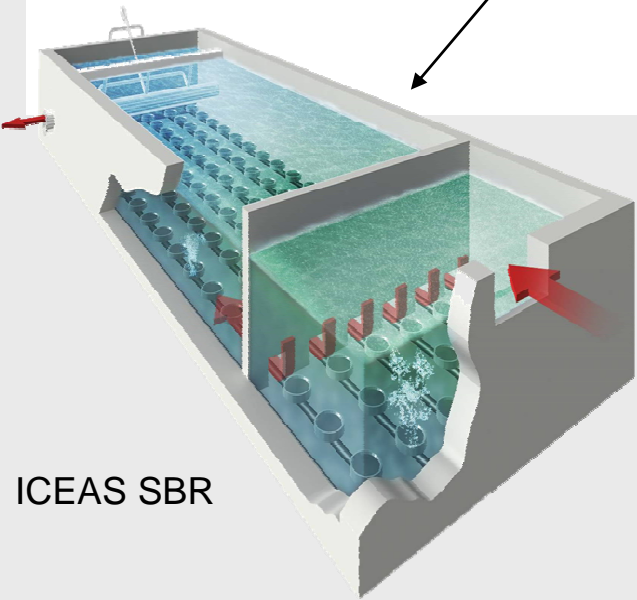
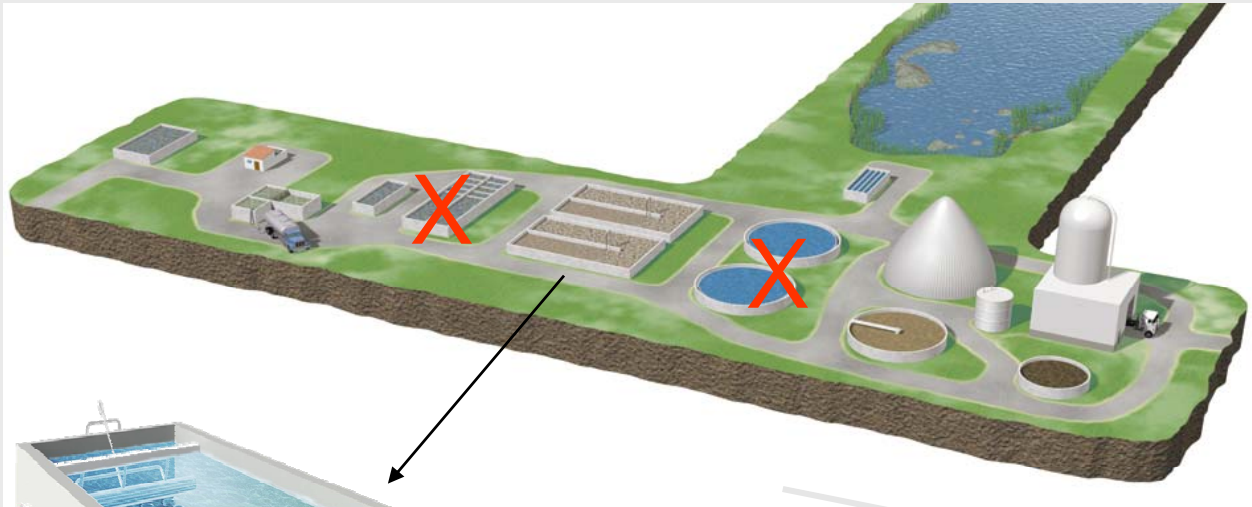
# Life Cycle Costs - Considerations

- Hilger Flygt (1933)
  - Adopted the business strategy which we term LCC today
- Capital Costs
  - Cost associated with designing and building a wastewater plant
- Operating and Maintenance Costs
  - Operating costs often contribute up to 80% to the LCC
- Product Selection
  - Product range enables product selection at its optimum performance curve
  - Product control systems allow greater energy efficiencies to be achieved
  - ITT provide online LCC training to assist their customers in product selection
- Process Selection
  - Overall process, Biological filters, ASP, SBR, MBR
  - Individual systems, pumping, aeration, filtration, disinfection
- Product design from the LCC standpoint
  - ITT products are designed using LCC principles

# Process Selection

- Selecting the optimum process
  - Depends on various parameters
    - Influent quality – each catchment is unique
    - Effluent quality – depends on the sensitivity of the receiving waters
    - Site location - geography, topography, environment,
    - Availability and cost of land
    - Availability / cost of power – a consideration in some rural communities
    - Proximity and influence of residential communities – location, noise, odour control and visibility become major issues
    - Client preference for technology – need to trial new technology
    - Recovery value of end product – arid or non-arid regions

# Process Selection ASP vs ICEAS SBR vs MBR



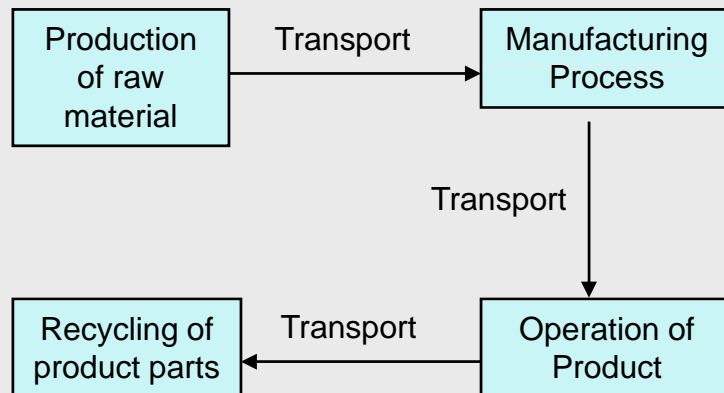
# Product Selection – Biological Aeration

- Aeration systems
  - 70% of the energy is consumed in providing the aeration to the biological treatment stage
- Improvements in Aeration Efficiency
  - Surface aeration (OTE  $< 1.5 \text{ kgO}_2/\text{kW.hr}$ )
  - Jet aeration (OTE  $< 1.0 - 2.5 \text{ kgO}_2/\text{kW.hr}$ )
  - Diffused aeration
    - Coarse bubble (OTE  $1.5 - 2.5 \text{ kgO}_2/\text{kW.hr}$ )
    - Fine bubble (OTE  $4.5 - 6.0 \text{ kgO}_2/\text{kW.hr}$ )
      - EPDM Tubular diffusers
      - EPDM disc diffusers
      - Panel diffusers



# Product Selection – Pumps

- Select from a wide range
  - To locate a pump with performance characteristics which best match requirements
- Consider Energy / Carbon Reduction
  - Environmental Product Declarations (EPD) and Climate Declarations
    - combining total energy consumed and carbon emissions for a product through its lifetime.



Flygt are one of only a few pump companies providing EPD statements



# Recycling and Reuse

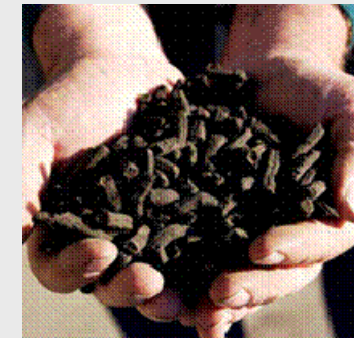
- ITT Policy - Product Refurbishment over Replacement
  - Less carbon emissions, faster turnaround
- Recycling of Products
  - Metal scrap, pump casings - reused in manufacturing process
  - EPDM diffusers can be chipped and reused in playground surfacing
  - uPVC grids can be chipped and reused in lower grade plastics
- Reuse of Final Effluent
  - Industrial water, irrigation water, aquifer recharge
- Reuse of Sludge
  - To produce methane and power to the works
  - Dried to produce fertiliser pellets for agriculture
  - Spread to land as soil conditioner / fertiliser
  - Incinerated to generate power

# Product Recovery – Final Effluent for Irrigation



# Energy Recovery from Sludge

- Anaerobic digestion
  - Digested sludge produces gas used to generate excess energy through CHP plants
- Thermal Drying
  - Produces pellets suitable for agriculture or incineration
- Incineration
  - Incinerated on a fluidised bed at 850°C provides more energy than it consumes
- Gasification
  - Plasma Gasification Process – produces gases suitable for power generation and a bi-product material suitable for use in construction



# Energy Recovery Systems – RO Pumping

- Wastewater RO systems require high pressure >35bar
- Energy is recovered by using the pressure within the waste stream from the RO to boost the pressure at the high pressure inlet pump
- Savings in energy < 40%



# Summary

- Wastewater Treatment has traditionally been a large consumer of energy.
- Future water quality legislation will continue to drive treatment costs up
- Increasing land value drives the need for more costly compact plants
- Future product development can help reduce energy costs
- Process design and systems management will do more to reduce energy consumption