Breakfast with the American Academy of Environmental Engineers (AAEE)

Dick Pope, PE, BCEE

February 3, 2009
AAEE Competition Background

- Started in 1989
- Looking for “Excellence in Environmental Engineering”
- Provide recognition for environmental engineer’s work
- AAEE received 26 submittals in 2008
When is this Competition held?

- Annually
- Submittals* due by February 1st
- Selections announced April or May of each year

*For information on submittal requirements go to the AAEE website (www.aaee.net) and click on Excellence in Environmental Engineering Competition under Programs.
How are the Submittals Evaluated?

- Independent panel
  - Distinguished experts

- Review criteria
  - Holistic environmental perspective
  - Innovation
  - Proven performance
  - Customer satisfaction
  - Contribution to an improved quality of life & economic efficiency
How are the Submittals Evaluated?

- Scores tallied
  - Overall top scorer: Superior Achievement Award
  - Category Top scorer: Grand Prize
  - Runner up: Honor Award*

* Scoring within 90% of Grand Prize.
What Categories are Judged?

- Research
- Planning
- Design
- Operations & Management
- Small Projects
- University Research
- Superior Achievement Award
Why Does AAEE Conduct Competitions?

- Identify
- Recognize
- Highlight
- Reward

*Best of today’s environmental engineering projects*

*Illustrate essential role of Environmental Engineering in providing a HEALTHY planet*
Superior Achievement Awarded

Kay Bailey Hutchinson Desalination Facility, El Paso TX
Entering Firm: CDM

CHALLENGES

• Provide drinking water supply
  – El Paso and Ft. Bliss
  – In desert
  – Inland
• Available supplies
  – Brackish groundwater
• How to dispose of concentrate
Superior Achievement Awarded

Kay Bailey Hutchinson Desalination Facility, El Paso TX

Entering Firm: CDM

INNOVATIONS

• Deep well injection of RO concentrate
  – 3,500 feet below ground

• Application of two-stage RO process
  – Pilot testing (on-site)

• Integrate limited resources
  – 30 supply and blend wells
  – 19 miles of collector/transmission pipe
  – 22 miles of concentrate disposal pipe
Superior Achievement Awarded

Kay Bailey Hutchinson Desalination Facility, El Paso TX
Entering Firm: CDM

BENEFITS

• Largest inland desalination project
  – 27.5 mgd
• Partnership between
  – El Paso Water Utilities
  – US DOD – Ft. Bliss
  • Remained and increased presence
• Prevent further brackish water intrusion
• Included research and learning center
Research Grand Prize

Glendale Demonstration – Scale Evaluation of Chlorite Ion to Control Nitrification in a Distribution System and Reservoirs, Glendale, CA
Entering Firm: Malcolm Pirnie, Inc.

CHALLENGES

• City of Glendale faces significant water challenges caused by nitrification in water system

• Nitrification affect ~30% of US water utilities
  – Using chloramines as disinfectant
  – Very costly to maintain
Glendale Demonstration – Scale Evaluation of Chlorite Ion to Control Nitrification in a Distribution System and Reservoirs, Glendale CA

Entering Firm: Malcolm Pirnie, Inc.

CHALLENGES

• Adverse effects of nitrification on water quality
  – Loss of total chlorine residual
  – Increase in nitrite/nitrate levels
  – Decrease in pH
  – Increase in corrosion rates
  – Increase in microbiological activity
Research Grand Prize

Glendale Demonstration – Scale Evaluation of Chlorite Ion to Control Nitrification in a Distribution System and Reservoirs, Glendale CA

Entering Firm: Malcolm Pirnie, Inc.

INNOVATIONS

- Nitrification control by chlorite ion addition
  - Demonstration test on section of distribution system
Research Grand Prize

Glendale Demonstration – Scale Evaluation of Chlorite Ion to Control Nitrification in a Distribution System and Reservoirs, Glendale CA
Entering Firm: Malcolm Pirnie, Inc.

INNOVATIONS

• Unique analytical method (first time use)
  – Molecular DNA amplification
  – Track populations of ammonia oxidizing bacteria to promote nitrification

• Simplified chlorite standard method
  – More reliable for operators to use
Research Grand Prize

Glendale Demonstration – Scale Evaluation of Chlorite Ion to Control Nitrification in a Distribution System and Reservoirs, Glendale CA

Entering Firm: Malcolm Pirnie, Inc.

BENEFITS

• Provide reliable control of nitrification using chlorite
• Reduced exposure to disinfection byproducts
• Reduced chlorine taste to water
• Lower cost of control
• Reduced health risk/regulatory violations
Planning Grand Prize

Granular Activated Carbon Master Planning Project, Birmingham AL
Entering Firm: Malcolm Pirnie, Inc.

CHALLENGES

- Comply with upcoming Federal Stage 2 Rule
- Removal of disinfection byproducts (DBP)
- Protecting drinking water supplies
- Four water treatment facilities
- Birmingham WaterWorks and Sewer Board (BWWSB)
Planning Grand Prize

Granular Activated Carbon Master Planning Project, Birmingham AL
Entering Firm: Malcolm Pirnie, Inc.

CHALLENGES

• Develop affordable low-cost strategy
  – Previous plan – expensive alternative
  – Limited funds available
  – Very limited space
  – Re-evaluate solution
Planning Grand Prize

Granular Activated Carbon Master Planning Project, Birmingham AL
Entering Firm: Malcolm Pirnie, Inc.

CHALLENGES

• Implement within 5 years
  – Minimize changes to operations
  – Avoid plant shutdowns/
    summer time derating
  – Avoid significant capital and operating costs
Planning Grand Prize

Granular Activated Carbon Master Planning Project, Birmingham AL
Entering Firm: Malcolm Pirnie, Inc.

INNOVATIONS

• Regulatory compliance with low cost plant upgrades

• Modify existing conventional GAC filters
  – Create GAC biofilters
  – Achieve adsorption and microbial growth
  – Microbes consume organic compounds
  – Ozone pretreatment eliminated
Granular Activated Carbon Master Planning Project, Birmingham AL
Entering Firm: Malcolm Pirnie, Inc.

INNOVATIONS

• Bench/Pilot scale demonstrations
  – Compliance with Rule
  – Removes DBP precursors
  – Viable hybrid technology
Planning Grand Prize

Granular Activated Carbon Master Planning Project, Birmingham AL
Entering Firm: Malcolm Pirnie, Inc.

BENEFITS

• Water Quality goals achieved
  – High quality, good-tasting water
  – Meets deadline

• Minimizes GAC waste/energy
  – Extends media life 3 – 5 X
  – No ozone generation
Planning Grand Prize

Granular Activated Carbon Master Planning Project, Birmingham AL
Entering Firm: Malcolm Pirnie, Inc.

BENEFITS

• Avoids water rate increases
  – Savings of $35M at 1 facility

• Minor modifications to existing infrastructure
  – Leveraging existing systems
Design Grand Prize

Orange County Groundwater Replenishment, Fountain Valley CA
Entering Firm: R. Bruce Chalmers, PE

CHALLENGES

- Address water supply issues
  - Extended droughts
  - Continued population growth
  - Salt water intrusion
  - Supplying safe drinking water
Design Grand Prize

Orange County Groundwater Replenishment, Fountain Valley CA
*Entering Firm: R. Bruce Chalmers, PE*

**CHALLENGES**

- Implement sustainable water supply solution
  - Reduce dependence on imported water
    - Northern California or Colorado River
  - Reduce energy demand
- Minimize land requirement
Design Grand Prize

Orange County Groundwater Replenishment, Fountain Valley CA
Entering Firm: R. Bruce Chalmers, PE

INNOVATIONS

• Convert highly treated wastewater
  – Potable, near distilled, water beyond DW standards
  – Add minerals for stability

• Apply Microfiltration (pretreatment), Reverse Osmosis (purification), Ultraviolet Light (disinfection)
  – UV removes: bacteria, emerging contaminants and viruses
Design Grand Prize

Orange County Groundwater Replenishment, Fountain Valley CA
Entering Firm: R. Bruce Chalmers, PE

INNOVATIONS

• Injected into seawater barrier
  – Prevents salt water diffusion
  – Reduces TDS in water

• Percolated into aquifers
  – Providing new water source
Design Grand Prize

Orange County Groundwater Replenishment, Fountain Valley CA
Entering Firm: R. Bruce Chalmers, PE

**BENEFITS**

- Reduces dependence on imported water
  - Saves water resources, energy, and money
- Provides new water source
  - 70 mgd (for 144,000 households)
  - Meets stringent drinking water criteria
- Stops aquifer salt water intrusion
Design Grand Prize

Orange County Groundwater Replenishment, Fountain Valley CA
Entering Firm: R. Bruce Chalmers, PE

BENEFITS

• Makes use of previously wasted resource
• Highly automated
  – Reducing staff required
• Expandable to 130 mgd

Setting standard for recycled wastewater: water projects
Operations/Management Grand Prize

SPEIM / LTM / O&M Program at MMR, Otis Ang MA
Entering Firm: AFCEE and CH2M Hill

CHALLENGES

• Effectively treating contaminated groundwater
  – 16 mgd
  – 8 major extract/treat/re-inject systems

• Reduce historic impacts
  – Phosphorus
  – Chlorinated solvents in surface waters

• Demonstrate local non-impact
  – Monitor wetlands, cranberry bogs, water bodies

• Managing data input/data base
Operations/Management Grand Prize

SPEIM / LTM / O&M Program at MMR, Otis Ang MA
Entering Firm: AFCEE and CH2MHiIl

INNOVATIONS

- Reducing energy consumption
  - Wind turbine (providing 25% of energy)
  - Using VFDs
  - Eliminating pumps/reducing motors

- Reduce phosphorus impacts:
  - Install iron geochemical barrier
  - Removes ~67% of phosphorus
Operations/Management Grand Prize

SPEIM / LTM / O&M Program at MMR, Otis Ang MA

Entering Firm: AFCEE and CH2MHiIl

INNOVATIONS

• Data management
  – Simplified web-based data management
  – Auto QC check
  – Easy access
Operations/Management Grand Prize

SPEIM / LTM / O&M Program at MMR, Otis Ang MA

Entering Firm: AFCEE and CH2M HILL

BENEFITS

• Continuous monitoring assures public safety

• Reduced cost to treat and monitor waterways
  – Operate systems (energy)

• Reducing impacts of historic/existing discharges
University Research Grand Prize

Value-Added Products from Dry-Grind Corn Milling Stillage by Fungal Processing, Ames IA
Entering Firm: Fungal Research Group Iowa State University

CHALLENGES

• Convert corn-to-ethanol waste (stillage)
  – Useful products
  – Reduce energy
  – Economical

• Recycle water from ethanol production
  – Eliminate flash evaporation
University Research Grand Prize

Value-Added Products from Dry-Grind Corn Milling Stillage
by Fungal Processing, Ames IA
*Entering Firm: Fungal Research Group Iowa State University*

**INNOVATIONS**

- Use stillage to feed fungal bioreactors
- Stillage contains organic compounds
  - Micro-nutrients
  - pH of 4.5
  - Ideal for feeding fungal growth
- Feed fungus to swine/poultry
  - Replace lost corn stock
University Research Grand Prize

Value-Added Products from Dry-Grind Corn Milling Stillage by Fungal Processing, Ames IA

Entering Firm: Fungal Research Group Iowa State University

**BENEFITS**

- **Reduce ethanol production water consumption**
  - Drop 10 bgy
- **Reduce energy consumption**
  - Eliminate flash drying
  - Could save $800M/yr nationwide
- **Provide viable feedstock**
  - Supplementing corn
  - Reducing need for antibiotics
  - Healthier meat products
Small Projects Grand Prize

Reuse for Industrial, Agricultural, and Landscaping (RIAL), Amman Jordan
Entering Firm: CDM

CHALLENGES

• Provide water for arid land
  – Average rainfall: 8 inches
  – 75% of land is desert
  – Demand exceeds supply by 150 bg in 2005

• Convince stakeholders to reuse wastewater
  – Goal 100%

• Develop water reclamation for Industry, Agriculture and Urban Landscaping
Small Projects Grand Prize

Reuse for Industrial, Agricultural, and Landscaping (RIAL), Amman Jordan

Entering Firm: CDM

INNOVATIONS

• Underground irrigation process
  – Bundle water pipes
  – Inside overflow pipes
  – Preventing root blockages

• Implemented
  – Nationwide
  – Watershed-based approach with collaboration between Government, Business and Communities
Small Projects Grand Prize

Reuse for Industrial, Agricultural, and Landscaping (RIAL), Amman Jordan

Entering Firm: CDM

BENEFITS

• Increased standard of living
• Farmers saved water
  – Irrigated with reclaimed water
  – Now have multiple seasons
  – Crop yields more than doubled
  – Income tripled
• Urban landscape expansion
  – Citizens enjoyed greenery
  – Expanded landscaped area
  – Use as park