Program will start at 10:00 am

EMERGING TECHNOLOGIES COORDINATING COUNCIL

ETCC QUARTERLY MEETING: *MOVING THE NEEDLE IN INDUSTRIAL EFFICIENCY*

December 10, 2014
Downey, CA
HOSTED BY: Southern California Gas Company

WELCOME!!

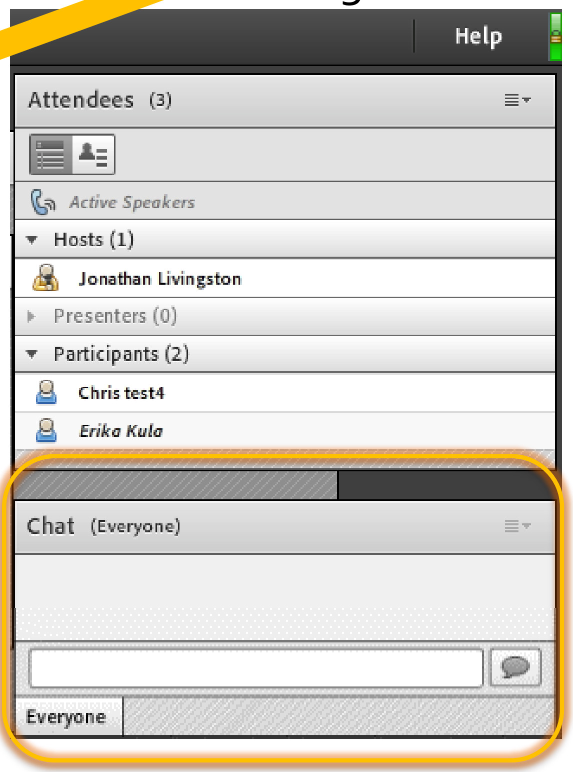
Before we get started….
housekeeping and safety

WEBINAR PARTICIPANTS

- Quick logistics
  - Phone lines are muted, so if no sound is coming from your speakers, click here
  - Speaker check: select "raise" hand in the control panel to confirm you are able to hear
  - Please use question field to ask questions during Q&A or if any technical issues

Left Corner

Right Corner



HOUSEKEEPING

- Please turn off or silence your phone, and step outside for any non-program conversations
- Slides will be posted to www.etcc-ca.com
- Don't forget to fill out evaluations!

SAFETY MESSAGE

- In the event of an emergency:
  - Earthquake
  - Fire
  - Other evacuation
- Meeting point
- 911
- CPR

INTRODUCTIONS

Special Welcome to:

- LADWP - now a member of the ETCC Leadership Team
- ETCC Advisory Council members
  - Inaugural Advisory Council meeting on July 16th - THANK YOU Advisors – we're looking forward to our next meeting in April 2015!

TODAY'S AGENDA

10:00 AM	Welcome, Safety and ETCC Updates
10:15 AM	Innovative Energy Technologies & Systems
11:30 AM	LUNCH (provided)
12:30 PM	Advanced Integrated Energy Controls & Processes
1:55 PM	Emerging Technologies Program Support of Industrial Sector – *panel presentations and interactive dialogue*
3:00 PM	Wrap Up

EMERGING TECHNOLOGIES COORDINATING COUNCIL (ETCC)

The ETCC supports the advancement of energy efficiency and demand response initiatives through its leadership, impact and influence in the emerging technology domain. It pursues this objective through strategic stakeholder engagement and effective and efficient coordination among ETCC members.

Members include:

EMERGING TECHNOLOGIES PROGRAM MISSION

"…to increase energy efficiency market demand and technology supply through evaluation of *emerging* and *underutilized* advanced technologies to increase customer savings…"

Emerging Technologies → **Programs** → **Codes and Standards**

Zero Net Energy

LED Lighting

HVAC

EE Rebates

Home Energy Report

Retail and Manufacturer Strategy

Contractor Training and outreach

Appliance Standards

Building Codes

ET PROGRAM DESIGN

Technology Development Support

- Provide resources to transform early-stage technologies / concepts into saleable products
- Develop forward-looking product specifications
- Provide outreach to early-stage entrepreneurs, investors, and analysts (TRIO)

Technology Assessment

- Evaluate performance claims
- Generate energy savings and cost data required for regulatory approval of a new EE measures

Technology Introduction Support

- Conduct scaled field placements to foster market traction
- Build demonstration showcases to create visibility / market awareness
- Conduct third-party solicitations using competitive bidding (TRIP solicitation)

UPCOMING ETCC EVENTS

Date	Event	Location & Host
February 18th	Q1 meeting: commercial	Los Angeles (SCE)
April 30th	Q2 meeting: cross-cutting	San Francisco (PG&E)
May 7th	Open Forum (FLoW)	Los Angeles (SDG&E)
August 11th	Q3 meeting: ag/industrial/water	Los Angeles (SoCal Gas)
November 4th	Q4 meeting: residential	Sacramento (SMUD & LADWP)
November 5th	Open Forum	Sacramento (SMUD)

To sign up for the ETCC Insight newsletter, check the box on the sign-in/registration sheet or sign up online at: www.etcc-ca.com/subscribe

Check the ETCC website for updates: http://www.etcc-ca.com/calendar

Next ET Summit will be in the spring of 2016 in Los Angeles

In case you missed it….

Slides are available at **http://www.etcc-ca.com/summits/2014**

INNOVATIVE ENERGY TECHNOLOGIES & SYSTEMS

Paden Cast, Review Engineer | Southern California Gas *[moderator]*

John McCown, Corporate Engineering | Eclipse, Inc.

Greg Danenhauer, VP of Engineering | Parker

Matt Gutschow, Heat Recovery Solutions | General Electric

STATEWIDE EMERGING TECHNOLOGIES PROGRAM

The Emerging Technologies Program

» Objective

- To gain acceptance of energy efficiency options not widely adopted in California
- Reduce performance uncertainties for new technologies
- Demonstrate and showcase new energy efficiency measures

Engineering Services Department

- Custom Energy Efficiency Projects
  - Large Commercial and Industrial Customers
    - Steam and Process Heating
  - Site Visits and Assessments
    - System approach
    - DOE SSAT / PHAST
  - Pre and Post Inspections
  - Review of projects prior to incentive funding
  - Interface with CPUC Commission Staff

Traditional Energy Efficiency Measures

- Steam
  - Economizers
  - Insulation
  - Steam Traps
  - Condensate Recovery
- Process Heating
  - Heat Curtains
  - Combustion Controls
  - Load Preheating

Why Traditional Measures are not Enough

- Traditional measures are beyond the early adoption stage
- Code enhancements
  - Stricter emissions requirements / BACT
  - Federal / State codes
- Difficulties in establishing standard practice
- Corporate directives to reduce energy consumption that exceed the limits of traditional measures

The Future of Energy Efficiency Measures

- Improving operation efficiency
- Commissioning
- Advanced features on smaller equipment
- Meeting emission requirements without sacrificing efficiency
- Interactive solutions

Barriers to Early Adoption of Emerging Technologies

- High cost
- Limited benefits
- Long lead times
- Long payback
- Aversion to risk
  - “Unproven” technologies
  - “Complicated” solutions
  - Previous “solutions” gone wrong

The Importance of Large C&I to Emerging Technologies

- Have access to more resources
- Logistical advantages
- Greater willingness to execute high risk/reward projects
- Design facilities with emerging technologies in mind
  - Public relations benefits
- Site demonstrations for Emerging Technologies

Emerging Technologies by Vendors

- Advanced Combustion
  - Eclipse, Inc. – Volume Combustion Burner
    - Meets low emissions requirements and is very efficient
- Steam Systems
  - Parker Industrial Boiler
    - Boilers with advanced energy efficiency features
- Heat Recovery
  - General Electric – Organic Rankine Cycle
    - Power production when thermal recovery is not needed

ECLIPSE®

Innovative Thermal Solutions

High Efficiency/Ultra Low NOx Burners – Volume Combustion (VCO)

John McCown

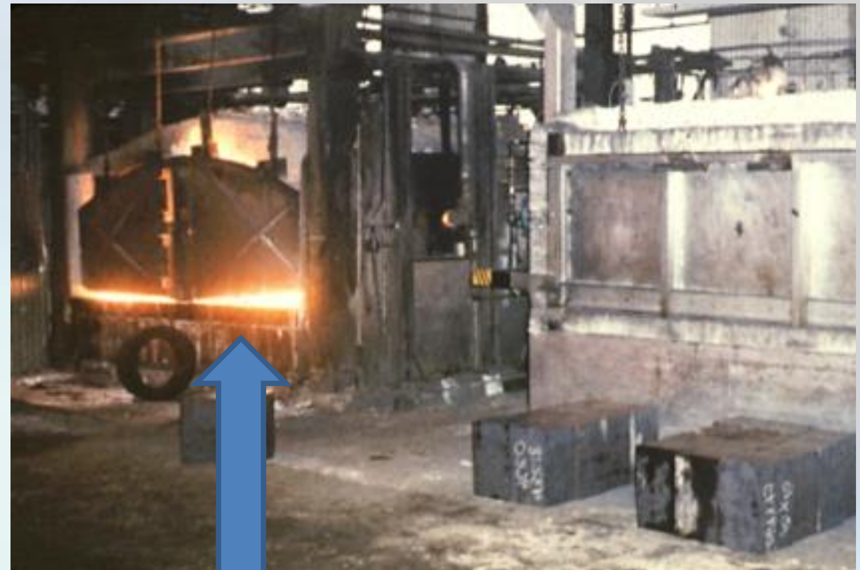
ETCC Q4 Quarterly Meeting
December 10, 2014

Efficiency: Becoming more important every day! Investments can have fast payback!

How to Improve Efficiency?

Furnace Improvements

- Minimizing Losses >
  - Doors, Walls…
- Proper Tuning



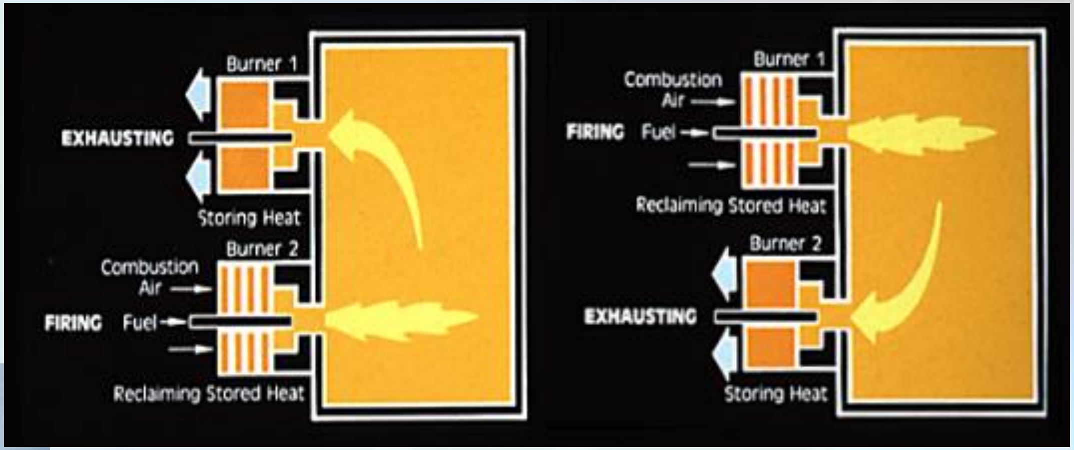
Wasted Heat!!!

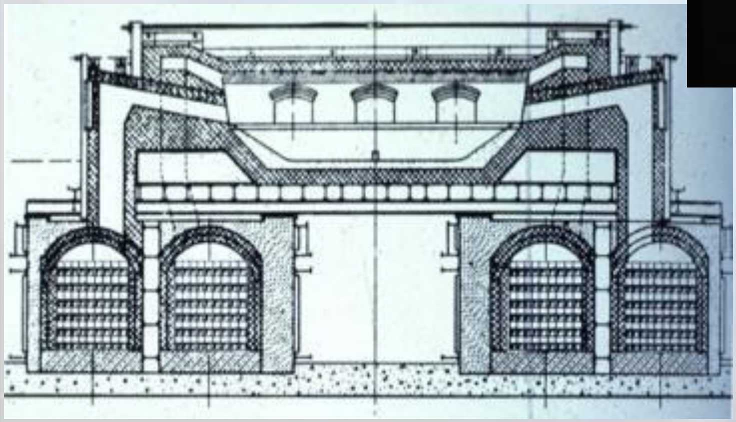
How to Improve Efficiency? <u>Heat Recovery</u>

For Industrial Gas Burners > Increasing the Combustion Air Temperature!!!

Regeneration:

- Frequently used in the Glass Industry but not as often in the Metals Industry





Heat Recovery has been used for a long time > Picture of a regenerative furnace from ~1900

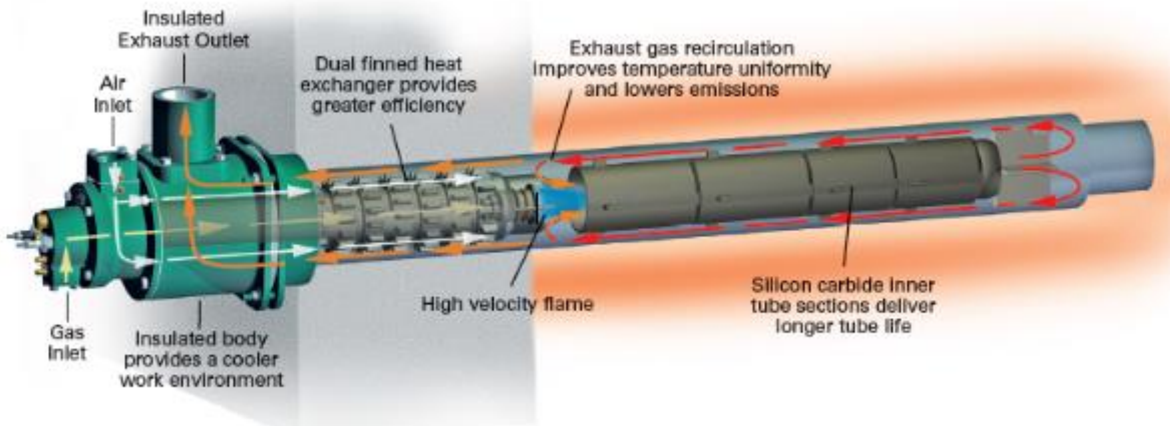
How to Improve Efficiency? Heat Recovery

Recuperation:

Very Common in Industrial Heating!!!

- ❑ Central Recuperators
- ❑ Plug Recuperators

❖ **Self Recuperation**



Efficiency vs Emissions - NOx in Southern California

SCAQMD –

- Rule 1147 (Less than 60ppm for applications above 1200F)
  - Does not reward for efficiency gains (Lb/hr vs PPM)

Example:

- Burner/Furnace at High Fire (5.0 MMBTU/hr) = 55 PPM NOx -> 0.34 Lb/hr NOx (No PCA)
- Burner/Furnace at High Fire (4.3 MMBTU/hr) = 66 PPM NOx -> 0.34 Lb/hr NOx (with 300F PCA)

Effects of Preheated Air:

- ➢ Increases available heat, which lowers gas consumption/required heat input
  - ➢ Fuel Savings!!!
  - ➢ Less CO_2!!!
- ➢ Increases flame temperature which turn, increases NOx
  - ➢ NOx increases rapidly as PCA temperatures increase
  - ➢ In Southern California, high efficiency burners are often not possible…

Without New Technologies!!!

NOx Reduction Methods

High Temp:

- FGR (Flue Gas Recirculation)

- Staged Combustion (Furnnox…)

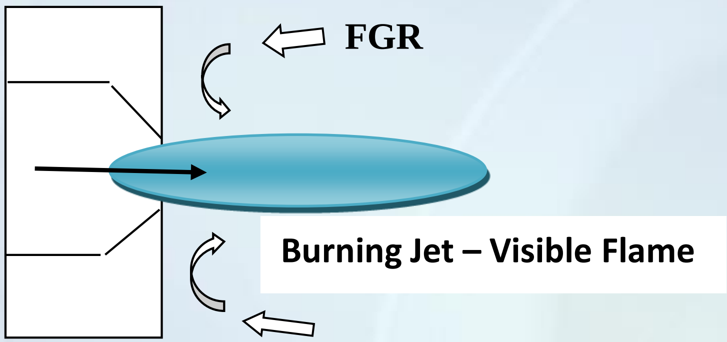
Other (Low Temp…)

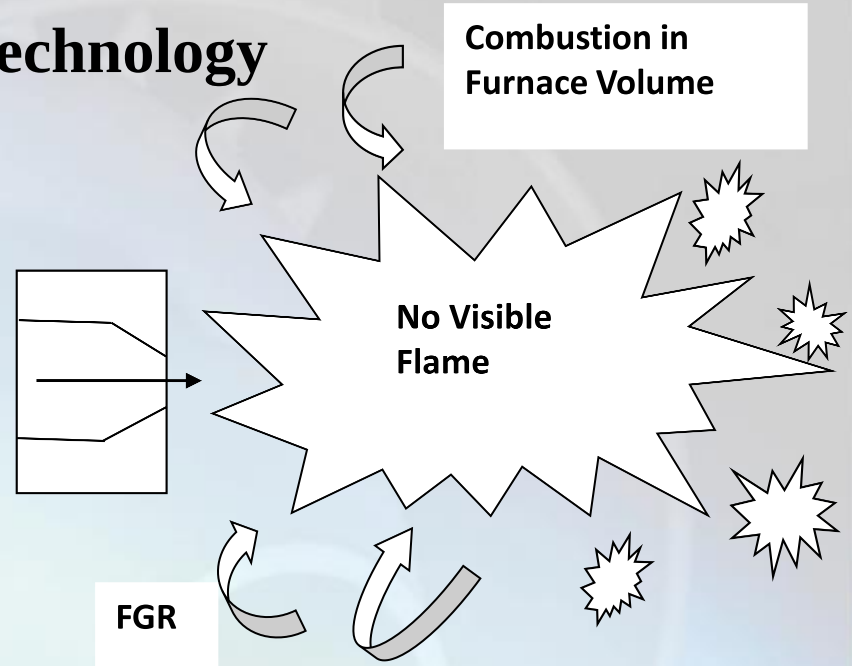
- Flame uniformity/High EXA (LX, WX…)

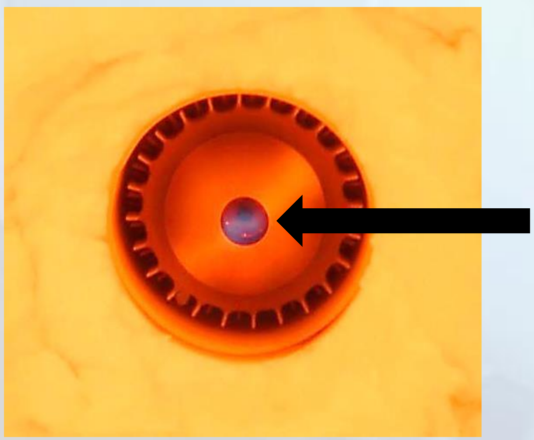
Bottom Line

Lower Peak Flame Temperatures

Volume Combustion (VCO) Technology

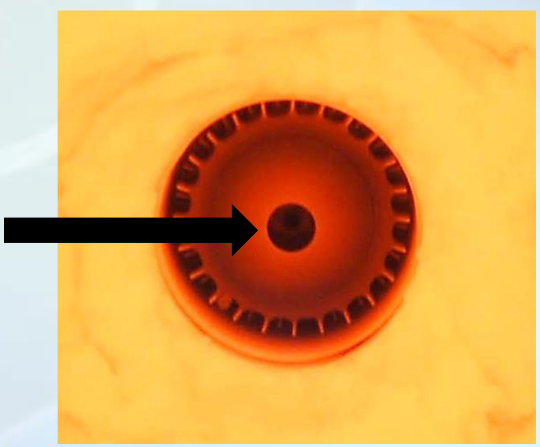






Flame

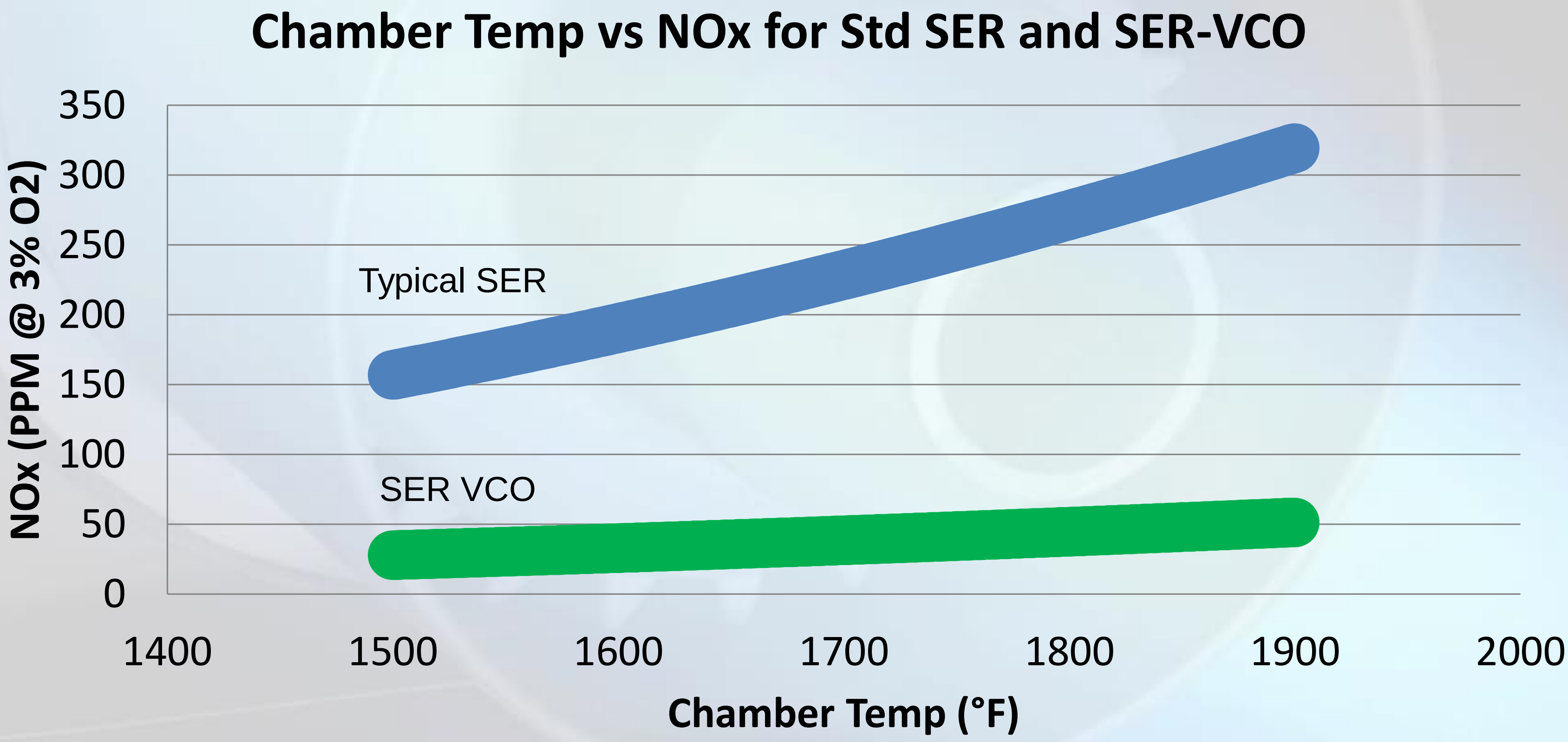
No Flame



- ❖ **INVISIBLE FLAME**
- ❖ **FLAMELESS COMBUSTION**
- ❖ **DISTRIBUTED FLAME**

SER VCO

- High Efficiency Single Ended Radiant (SER) tube burners typically produce very high NOx (PPM)



SER VCO Basics

- Start-up: The air/gas mixture is ignited with a spark to combust within the burner.
  - Flame is monitored with a flame rod or UV scanner

- VCO Mode: Combustion shifts from within the burner to the space or (“volume”) outside of the burner.
  - Once the furnace reaches auto-ignition, a pneumatic control is used to transition the burner from flame to VCO mode
  - After the flame has lifted off of the nozzle, the gas tube is allowed to recess to its home position without transferring back into flame mode.
  - The flame will no longer be present in the burner
  - At this time, the flame sensor will detect a loss of flame inside the combustor, but will allow the burner to continue firing.
  - The flame will not reenter the burner unless the temperature drops below auto-ignition and the controller signals for a spark.

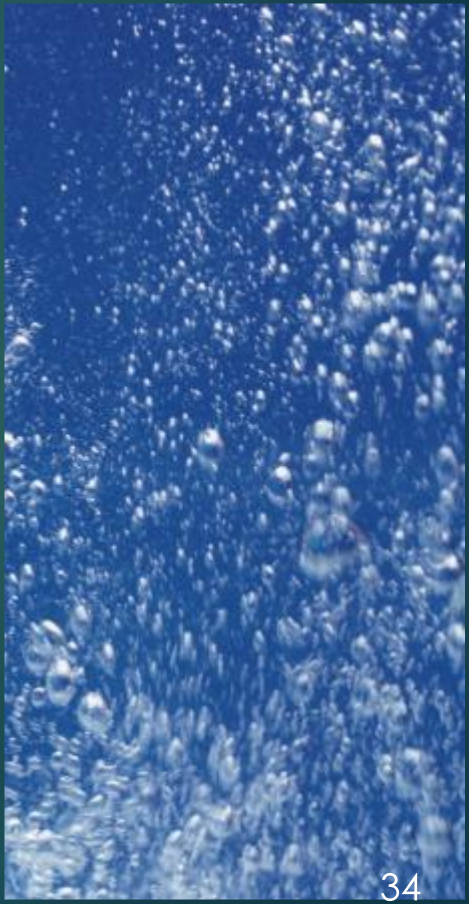
SER VCO Benefits

- ✓ Ultra Low NOx!!!
  - ✓ Different options for NOx vs. Air Pressure
- ✓ Pulse Fired
  - ✓ Repeatable Operation & Temperature Control
  - ✓ No additional LF tuning
  - ✓ Unlimited Turndown
- ✓ Exceptional radiant tube uniformity
- ✓ Cooler interior burner components (Longer lasting)
- ✓ 6 and 8 inch radiant tube sizes with a wide range of available inputs
- ✓ Packaged Solutions

Thank You!

New Energy Efficient Boilers and Systems

GREG DANENHAUER
gdanenhauer@parkerboiler.com
323-727-9800
LOS ANGELES, CA



Parker Boiler

- 1919 Beginnings: Hat Pressing
- Need created by need for steam and availability of natural gas
- Parker Boiler now owns over 130,000 sq. ft. of buildings on over 5 acres of property.
- Engineering/ Sales Staff
- Full Service Department
- National and International dealer network.

Opportunities Heating Solutions – Heating Systems

- Automobile
- Beverage Processing
- Chemical Processing
- Clean Rooms
- Cosmetics
- Dry Cleaning
- Electronics
- Food Production
- Health Food
- Hospitals
- Laundries
- Metal Finishing
- Pharmaceuticals
- Plating Plants
- Pressing/Laminating
- Residential
- Schools
- Studios
- Tank Warming

Efficiency

- Boilers: Utilize the maximum amount of energy from the fuel.

75% → 80% → 85/86% → 90%+

old school → Standard → Mid Efficiency Non Condensing → Condensing

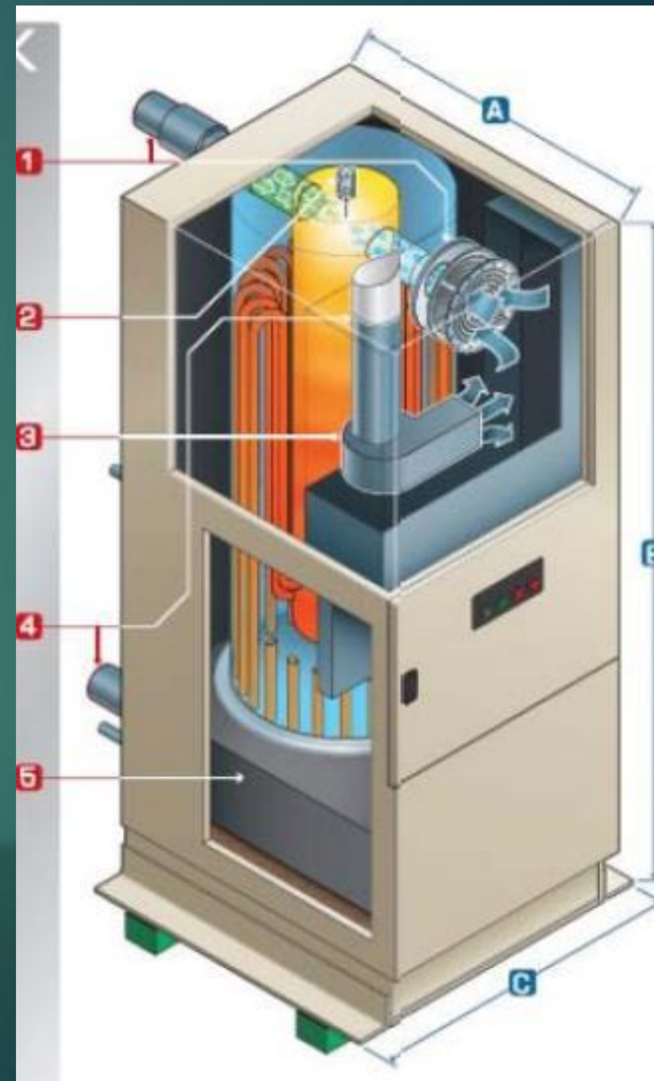
<u>Condensing Boilers</u>

- Bring flue gas temp below 120°F
  - This requires: Thinking (in building heat situations easier)
- Pros and Cons of condensing boilers

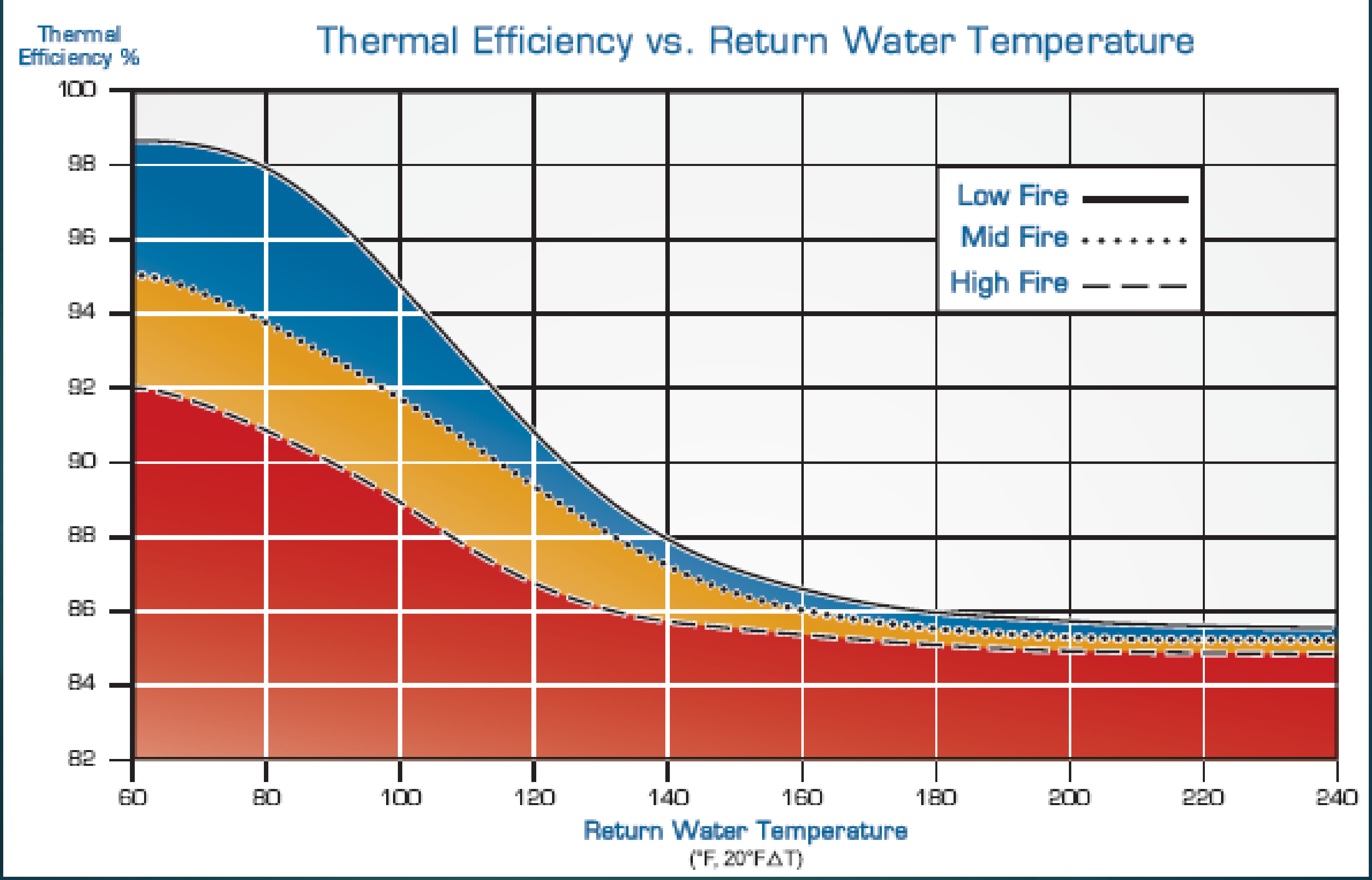
PARKER INDUSTRIAL BOILER

How Does a Condensing Boiler Work?

- Evolved from the development of traditional water-heating boilers.
- Boiler incorporates a large heat exchanger or secondary heat exchanger (typically stainless steel or aluminum).
- Water vapor produced in the combustion process condenses back into liquid form releasing its latent heat



WHAT IS THE CORRECT BOILER FOR THE



CONDENSING BOILER APPLICATION OR NOT

- Always An Interesting Conversation
- Application Specific Depending On
  a) Temperature Required
  b) Venting
  c) System Design
  d) Budget
- Many Condensing Boilers Are Failing In Short Order
- Technology From Europe
- Stainless Steel & Aluminum are materials of choice to resist corrosion

Stainless Steel

Industrial Market and Steam & Hot Water Boilers

Boiler Side

- Sealed Combustion Boilers
- Heat Reclaimers
- Condensing Heat Recovery
- Study The Application
- Look for Low Temp Water to Heat

What can we do to increase Efficiency

Waste Heat Economizers Non Condensing

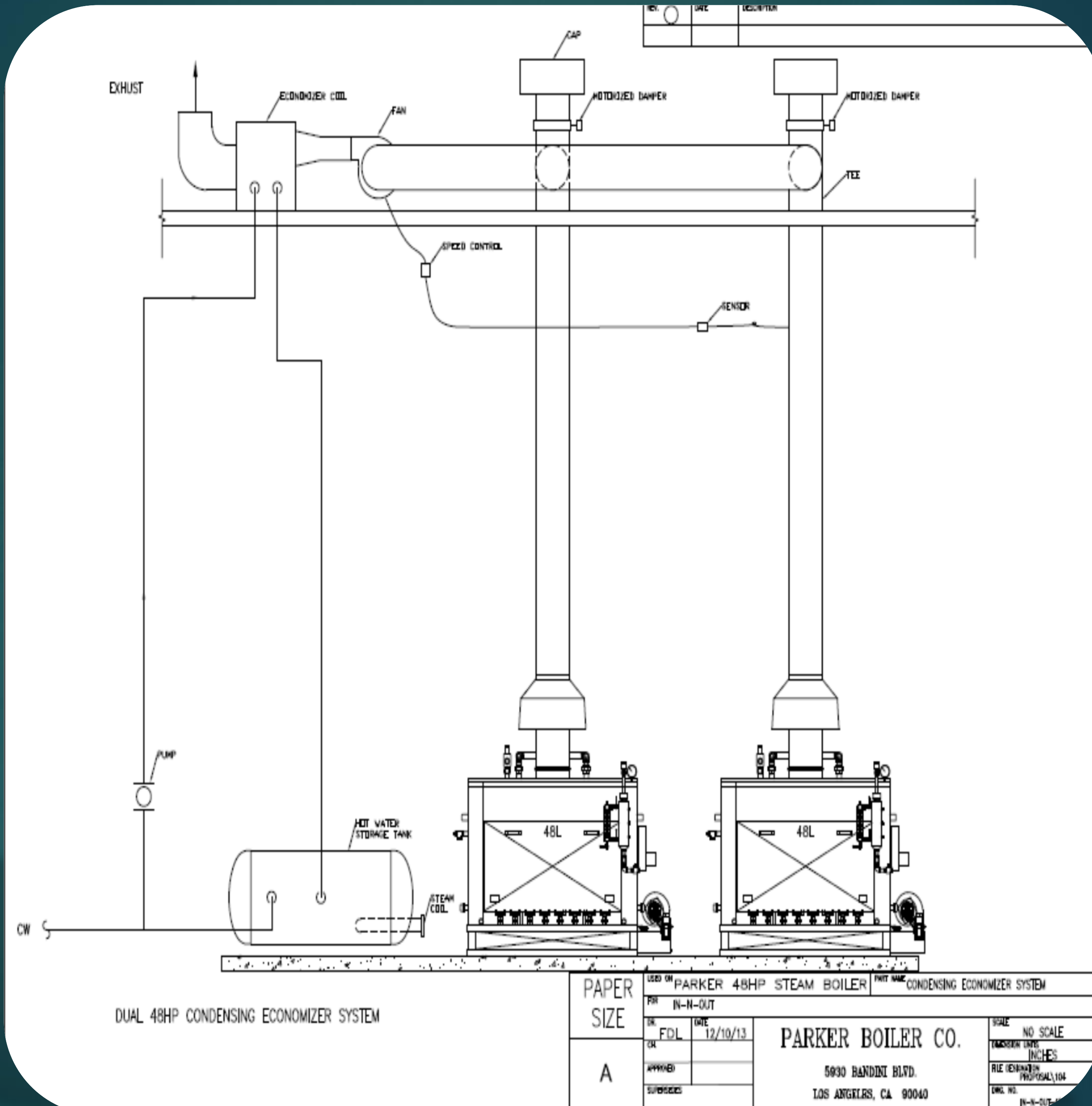
- SS tubes, aluminum fins
- SS jacket
- Gross savings 6-10%.
  5 bucks per hour on a larger boiler, great payback periods

- 84%

- (2) Parker Boiler 115L's with EM-24 Economizers at Steris Isomedix – San Diego, CA.

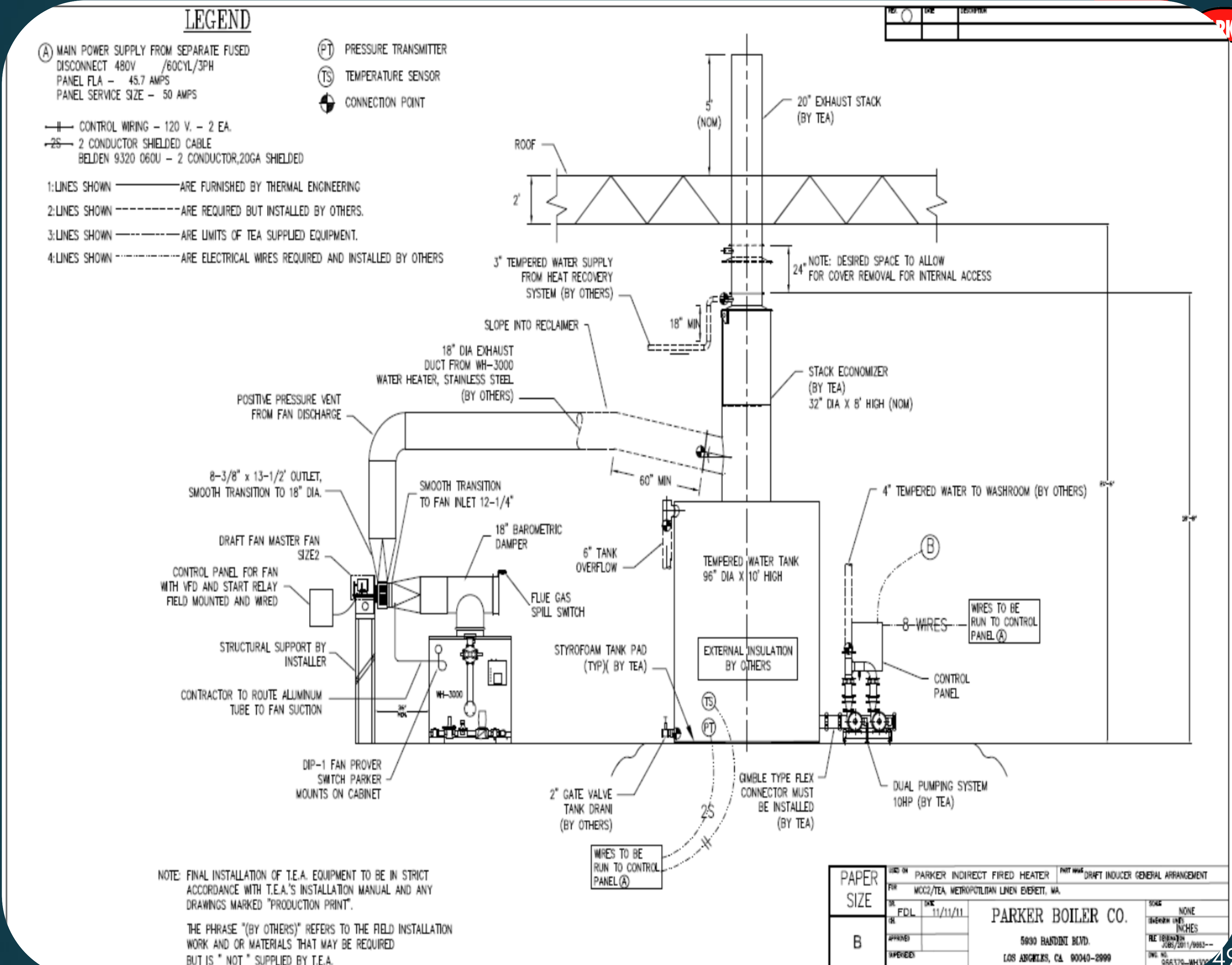
Modulating Flue Damper

Economizers - Condensing


CAP
EXHUST
ECONOMIZER COIL
FAN
MOTORIZED DAMPER
MOTORIZED DAMPER
TEE
SPEED CONTROL
SENSOR
PUMP
HOT WATER
STORAGE TANK
STEAM
COIL
CW
48L
48L
DUAL 48HP CONDENSING ECONOMIZER SYSTEM
PAPER
SIZE
A
USED ON PARKER 48HP STEAM BOILER
PART NAME CONDENSING ECONOMIZER SYSTEM
FOR IN-N-OUT
DR. FDL
DATE 12/10/13
CH.
APPROVED
SUPERSEDES
PARKER BOILER CO.
5930 BANDINI BLVD.
LOS ANGELES, CA 90040
SCALE NO SCALE
DIMENSION UNITS INCHES
FILE DESIGNATION PROPOSAL\104
DWG. NO.

Direct Contact Condensing Economizer

- Fuel Gas Bath


LEGEND
(A) MAIN POWER SUPPLY FROM SEPARATE FUSED DISCONNECT 480V /60CYL/3PH
PANEL FLA – 45.7 AMPS
PANEL SERVICE SIZE – 50 AMPS
(PT) PRESSURE TRANSMITTER
(TS) TEMPERATURE SENSOR
CONNECTION POINT
CONTROL WIRING – 120 V. – 2 EA.
2 CONDUCTOR SHIELDED CABLE
BELDEN 9320 060U – 2 CONDUCTOR,20GA SHIELDED
1:LINES SHOWN ARE FURNISHED BY THERMAL ENGINEERING
2:LINES SHOWN ARE REQUIRED BUT INSTALLED BY OTHERS.
3:LINES SHOWN ARE LIMITS OF TEA SUPPLIED EQUIPMENT.
4:LINES SHOWN ARE ELECTRICAL WIRES REQUIRED AND INSTALLED BY OTHERS
ROOF
5' (NOM)
2'
20" EXHAUST STACK (BY TEA)
24"
NOTE: DESIRED SPACE TO ALLOW FOR COVER REMOVAL FOR INTERNAL ACCESS
3" TEMPERED WATER SUPPLY FROM HEAT RECOVERY SYSTEM (BY OTHERS)
18" MIN
SLOPE INTO RECLAIMER
18" DIA EXHAUST DUCT FROM WH-3000 WATER HEATER, STAINLESS STEEL (BY OTHERS)
STACK ECONOMIZER (BY TEA) 32" DIA X 8' HIGH (NOM)
POSITIVE PRESSURE VENT FROM FAN DISCHARGE
60" MIN
8-3/8" x 13-1/2' OUTLET, SMOOTH TRANSITION TO 18" DIA.
SMOOTH TRANSITION TO FAN INLET 12-1/4"
4" TEMPERED WATER TO WASHROOM (BY OTHERS)
DRAFT FAN MASTER FAN SIZE2
18" BAROMETRIC DAMPER
6" TANK OVERFLOW
TEMPERED WATER TANK 96" DIA X 10' HIGH
(B)
CONTROL PANEL FOR FAN WITH VFD AND START RELAY FIELD MOUNTED AND WIRED
FLUE GAS SPILL SWITCH
8-WIRES
WIRES TO BE RUN TO CONTROL PANEL (A)
STRUCTURAL SUPPORT BY INSTALLER
STYROFOAM TANK PAD (TYP)(BY TEA)
EXTERNAL INSULATION BY OTHERS
CONTROL PANEL
WH-3000
CONTRACTOR TO ROUTE ALUMINUM TUBE TO FAN SUCTION
TS
PT
DIP-1 FAN PROVER SWITCH PARKER MOUNTS ON CABINET
2" GATE VALVE TANK DRANI (BY OTHERS)
GIMBLE TYPE FLEX CONNECTOR MUST BE INSTALLED (BY TEA)
DUAL PUMPING SYSTEM 10HP (BY TEA)
2S
WIRES TO BE RUN TO CONTROL PANEL (A)
NOTE: FINAL INSTALLATION OF T.E.A. EQUIPMENT TO BE IN STRICT ACCORDANCE WITH T.E.A.'S INSTALLATION MANUAL AND ANY DRAWINGS MARKED "PRODUCTION PRINT".
THE PHRASE "(BY OTHERS)" REFERS TO THE FIELD INSTALLATION WORK AND OR MATERIALS THAT MAY BE REQUIRED BUT IS " NOT " SUPPLIED BY T.E.A.
PAPER SIZE
B
PARKER INDIRECT FIRED HEATER
DRAFT INDUCER GENERAL ARRANGEMENT
MCC2/TEA, METROPOLITAN LINEN EVERETT, MA
FDL
11/11/11
PARKER BOILER CO.
5930 BANDINI BLVD.
LOS ANGELES, CA 90040-2999
NONE
INCHES

- Example:
  - Metal finishing plant / Plating line
  - Electric now
  - Consider gas
  - Customer provides plant layout with schedules
- Traditional Approach
  - Steam (operator, chemicals, blowdown)
  - Electrical (costly)
- Modern Approach
  - High temperature hot water

    230-275°F
  - H versus S Boiler (250°F)

REVIEW ENERGY COST

Rising Energy Costs Have you in Hot Water?
Maybe That's the Solution -
A Parker Medium or High Temp Hot Water System

PROCESS HEATING ENERGY COMPARISON

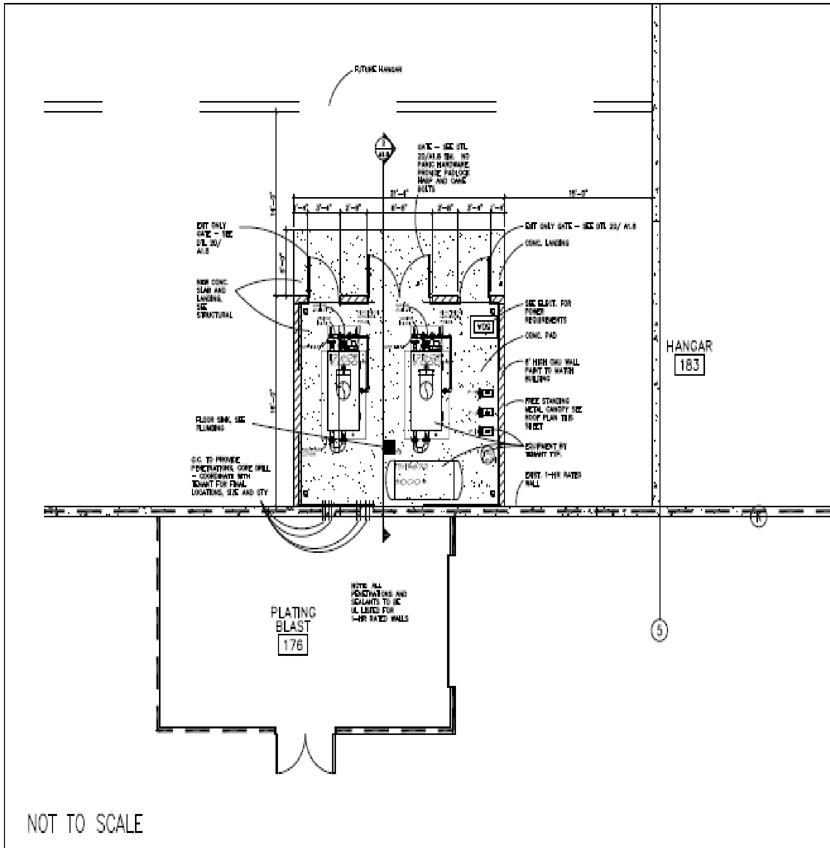
Energy Source	Efficiency	Average Cost Per Therm U.S.	Energy Cost Per Year**	Typical Annual Maintenance Cost	Approx Total Cost Per Year
Electric****	100%	$2.93	$123,060	$5,000 - $10,000 (Replacement Elements)	$133,060
High Efficiency Hot Water	Up to 86%	$0.67	$32,720	$600.00	$33,320
Hot Water	Minimum 80%	$0.67	$35,175	$500.00	$35,675
Steam, Gas Fired	70%***	$0.67	$40,200	$3,400.00 (Chemicals, Blow Off, Traps)	$43,600
Steam Converted to Hot Water	60%	$0.67	$46,900	$4,500.00	$51,400
Direct Immersion Burner	50%	$0.67	$56,280	$1,500.00 - $3,000.00 (Tuning/Service)	$59,280

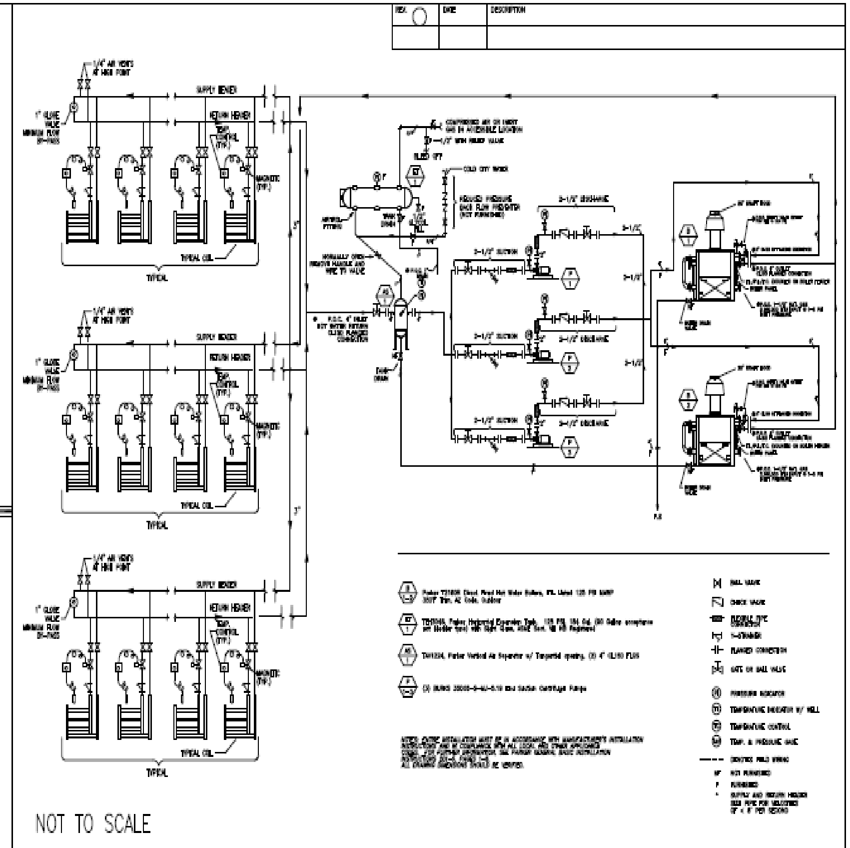
* Based on 50 hr weekly operating schedule, 50 weeks per yr (2500 hrs), at 75% rated capacity of equal to 16.8 therms output/hr
** Excludes local peak demand charges
*** Includes approx. flash stream energy losses
**** Cost per therm based on .10 per kwh

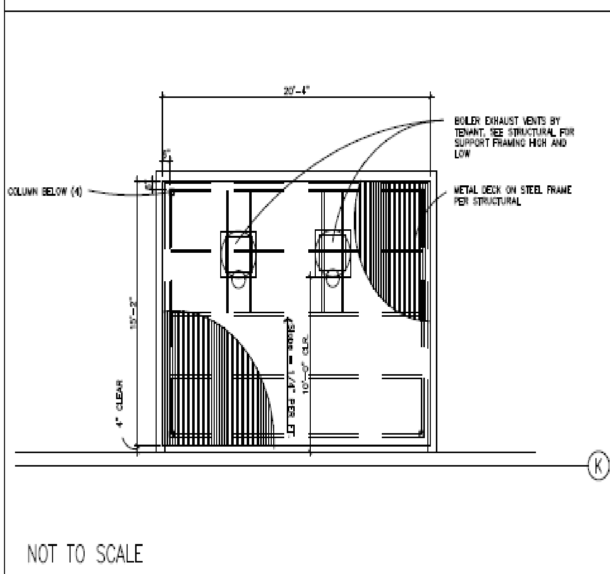
5930 Bandini Blvd.
Los Angeles, CA 90040
email sales@parkerboiler.com

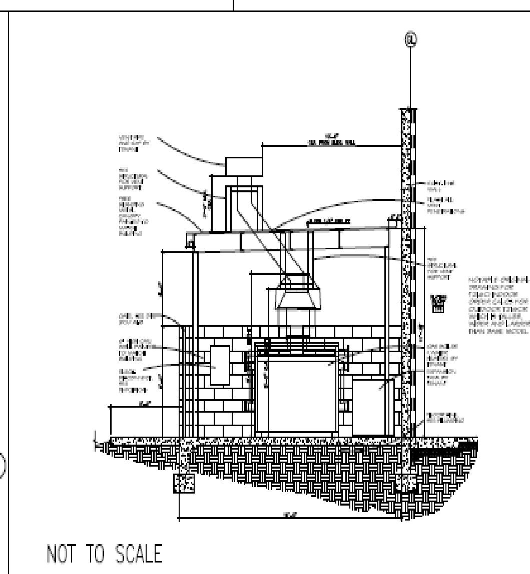
ph (323) 727.9800
fax (323) 722.2848
website www.parkerboiler.com

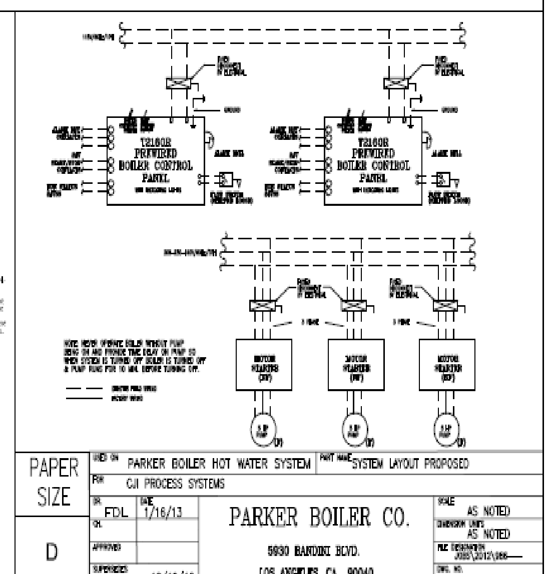
Design Assistance



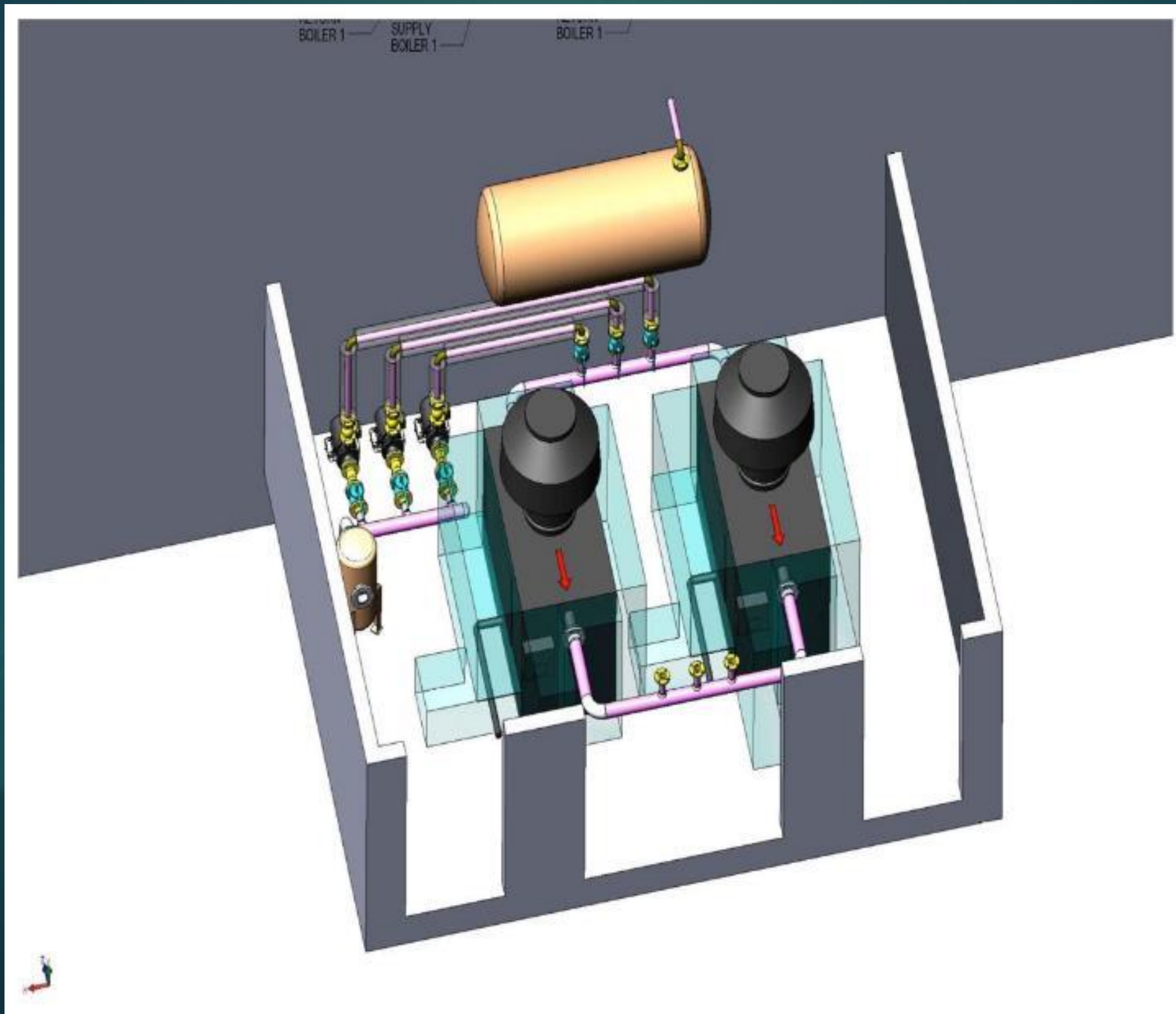








Design Assistance



Final Product

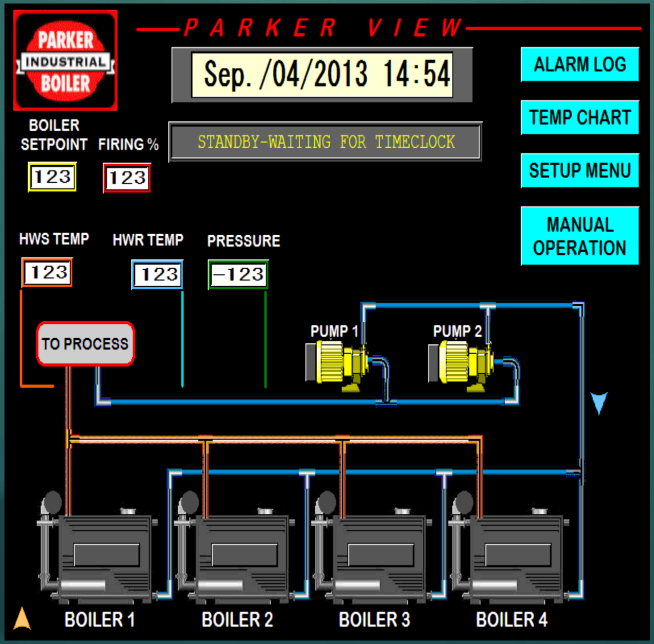
- 82-86% Efficient
- 250°F High Temperature Hot Water

Parker Remote View

- It can be connected to the local network or cell service for viewing from any connected computer with a standard flash enabled web browser.
- With the proper connection, the boiler and system can be viewed from anywhere via the internet (PC, Tablet, Smart Phone)

Parker Remote View

- The Remote View is custom designed for the job and may have many screens that show operational parameters and allow control of the setpoint (including outside air reset) and auxiliary equipment.



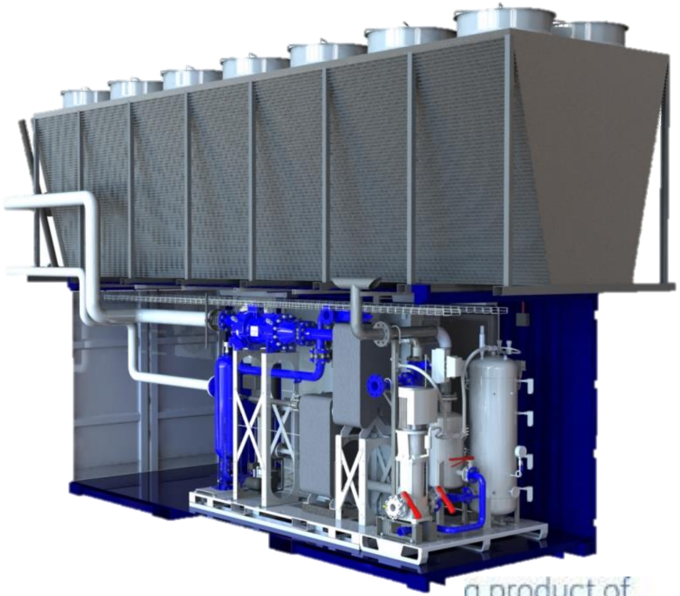
GE Distributed Power

The Clean Cycle

Heat to power generator

December 10, 2014

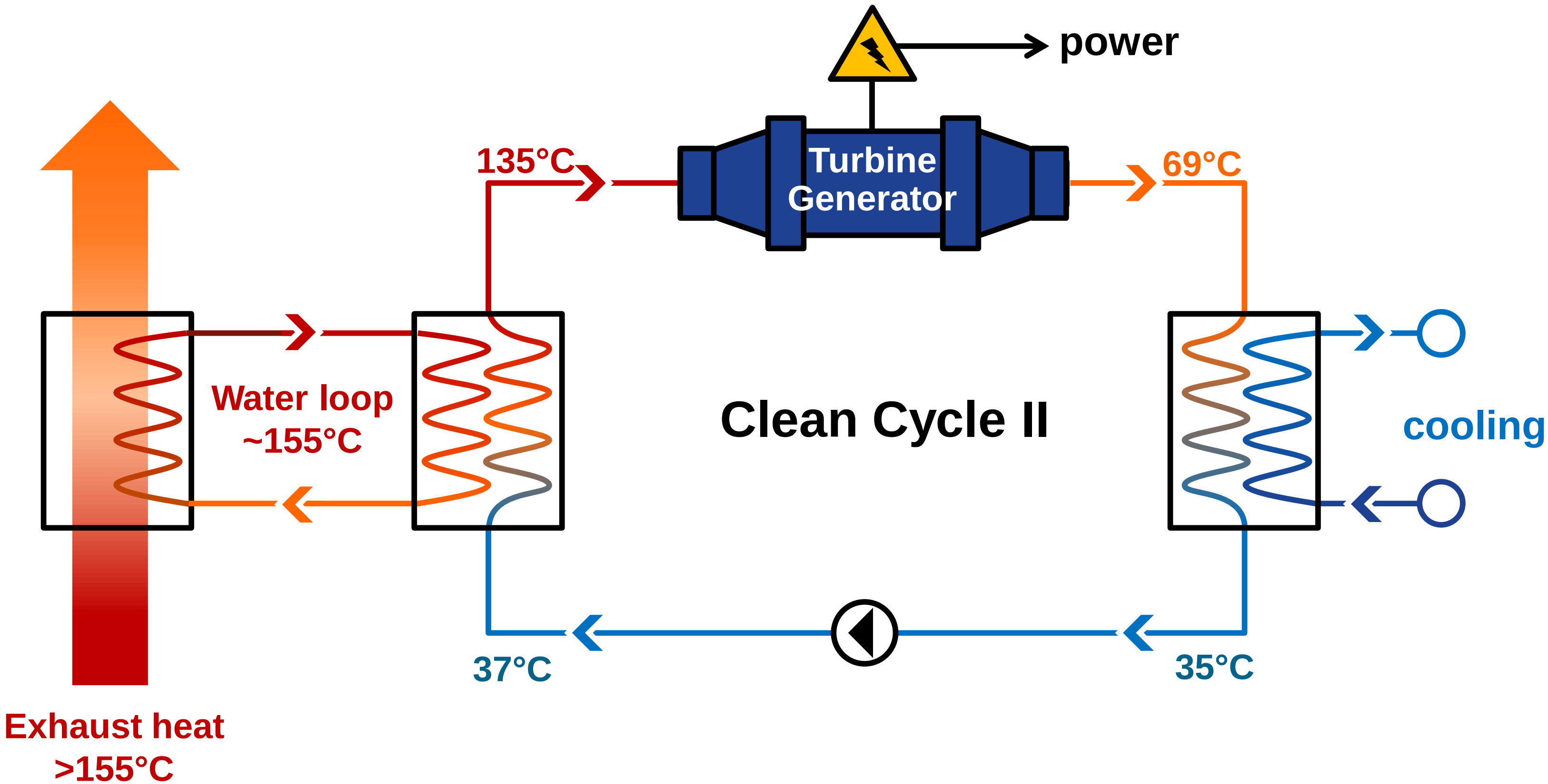
Matt Gutschow
Clean Cycle Technical Sales
GE Distributed Power
+1 562 314 4862
matthew.gutschow@ge.com



GE imagination at work

a product of ecomagination

The Organic Rankine Cycle (ORC)



Analogous to a steam turbine except instead of water, a refrigerant with lower boiling point is used as the working fluid

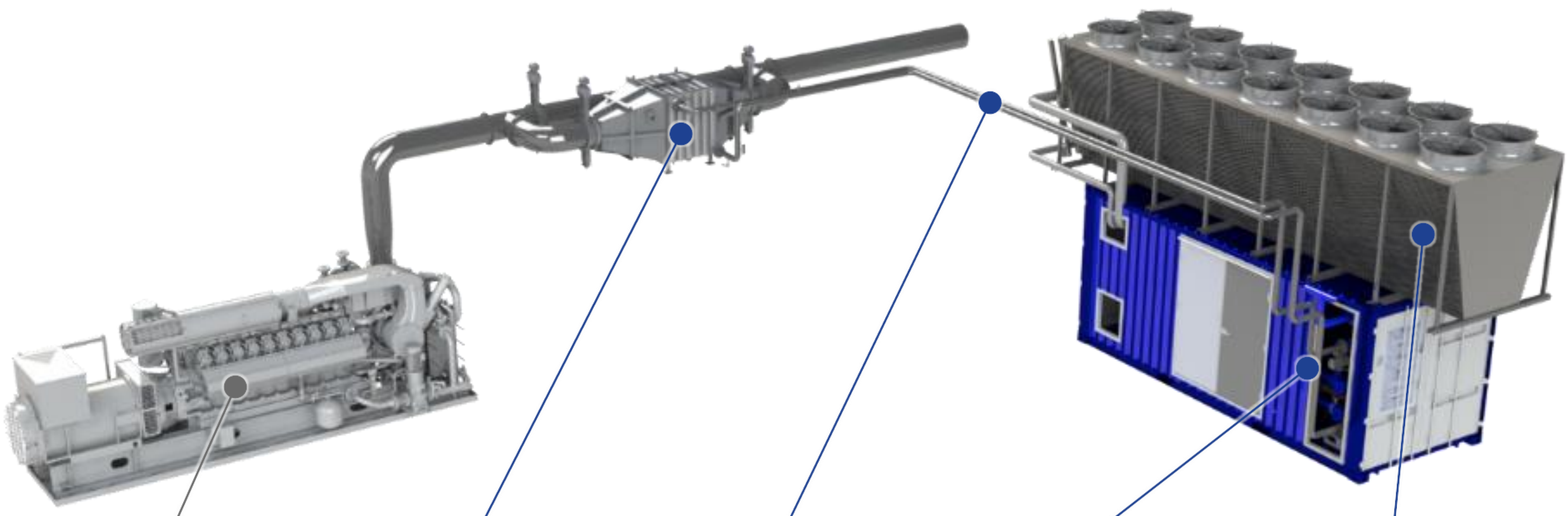
Components of an installation

Example: reciprocating engine heat

KEY

Existing plant

Clean Cycle & modular components



Heat source
- Focus: recip engines, boilers, turbines >1MW
- Utilize unused thermal energy in exhaust

Heat Capture
- Exhaust gas heat exchanger & damper
- Extracts heat from exhaust stream

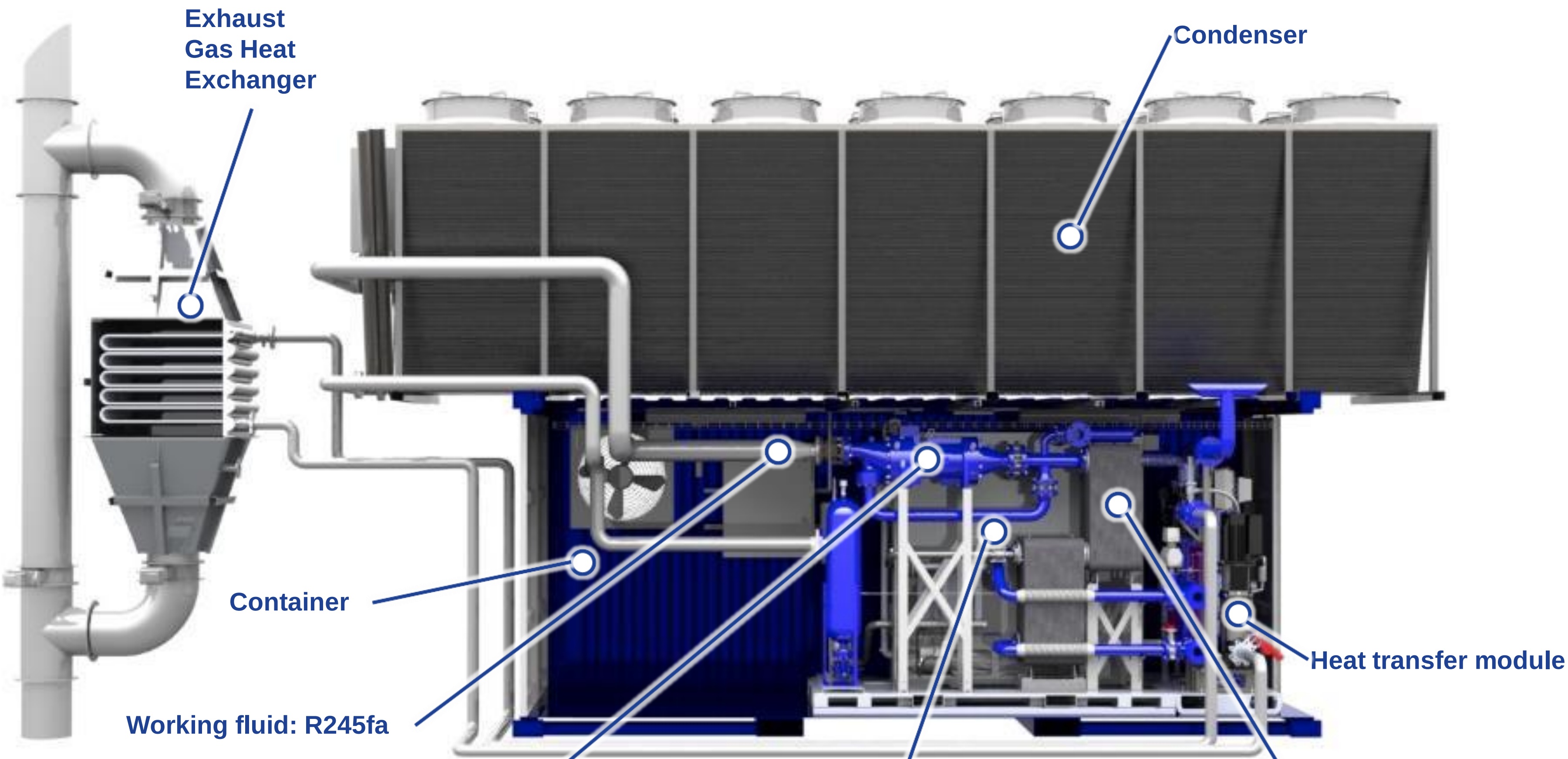
Heat Transfer
- Controls water loop that delivers heat from the heat exchanger to the Clean Cycle

Clean Cycle
- Converts heat into power
- Electrical output is at grid quality

Heat Rejection
- Cooling system used to condense the liquid used in the power conversion cycle

imagination at work

Inside the Clean Cycle package



imagination at work

Keys for Successful ORC Projects

Heat Source

- Engines, biomass boilers, turbines >1MW
- Base load operation – high annual run hours

Site

- Facility has space for equipment
- Emissions permits not impacted by cooler exhaust plume

Economics

- High electric rate or expensive fuel
- Capital availability – lease model relieves some capital burden

Application examples

Diesel

- Often 10+ 1.5MW engines / site
- Remote focus: mines & island

Process heat

- Often large, single heat source
- Cement, glass, steel, etc.

NNG

- Biomass boilers
- Engines: landfill, biogas

Same core package design & technology used across applications

ORC Project with SoCal Gas

Overview

- SoCal Gas R&D project at a compression site in Needles
- Prove out technology operation and benefit
- Outside SCAQMD, plenty of space, high run hours on engine

Benefits

- Improve engine fuel efficiency
- Reduction in the emissions per kW
- Qualifies for SGIP

Thank you.

imagination at work

Matt Gutschow

Clean Cycle Technical Sales
GE Distributed Power

+1 562 314 4862
matthew.gutschow@ge.com

LUNCH

Program will resume at 12:30 pm

PLEASE FILL OUT EVALUATIONS!

ADVANCED INTEGRATED ENERGY CONTROLS & PROCESSES

Jesse Martinez, Efficiency Engineering Supervisor | Southern California Gas *[moderator]*

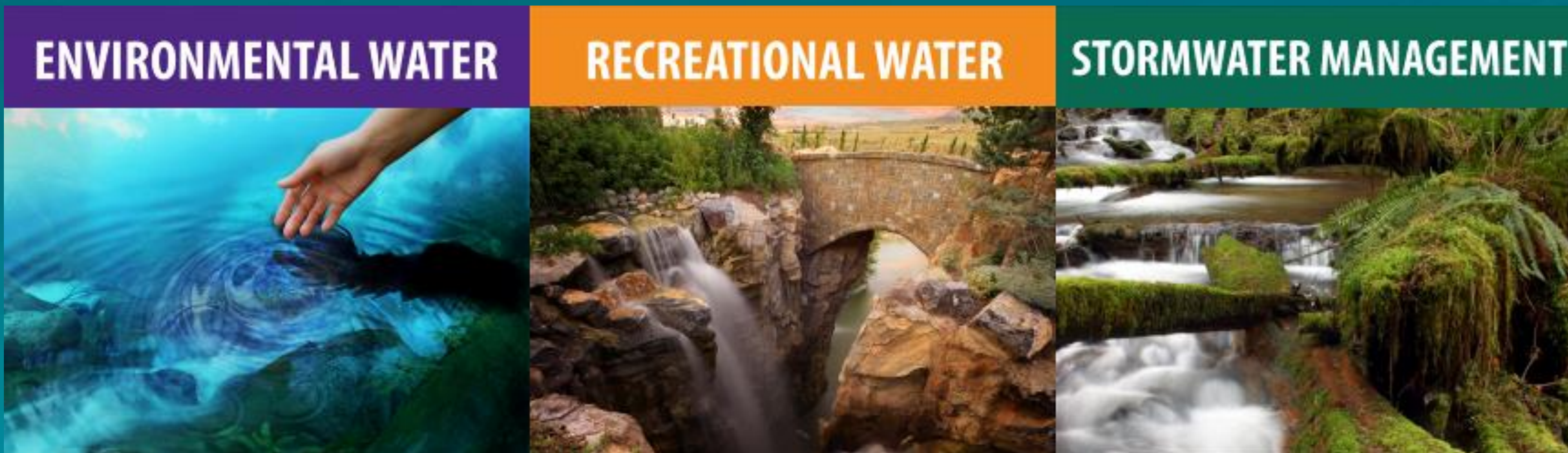
James Matthews, SVP | PACE

Diego Rosso, Professor | UC Irvine

Angela Shih, Professor | Cal Poly Pomona

Boaz Ur, Business Development and Strategy | Lightapp

PACE



Advanced Control Algorithms for Building & Utility Energy Management

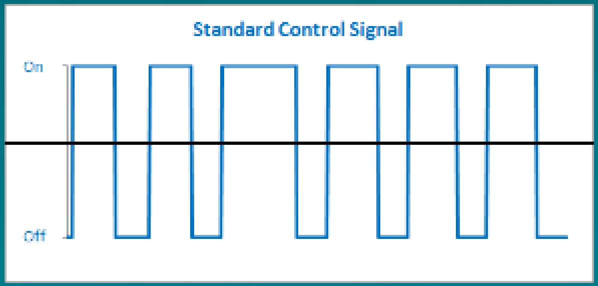
Presented By: James Matthews, PE
Senior Vice President
December 10, 2014

Traditional Types of Process Control

- On / Off – Set Point Control

  Responds to a Violation of high and low set points

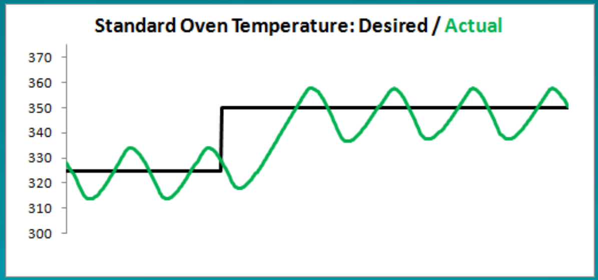
  Process Always in Error



- Ratio / Proportional Control

  Varies output Directly based on feedback signal

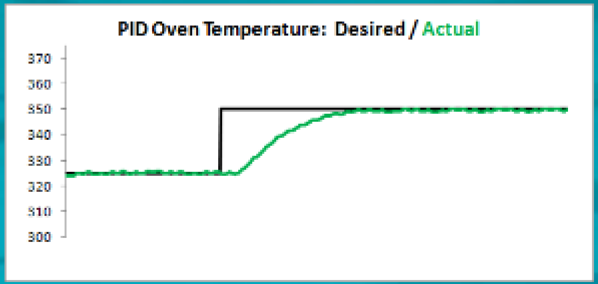
  Process Constantly "Seeking"



- PID Control

  Varies correction & output based on amount of Error

  Can be "tuned" for site conditions – but what if they constantly change?



PID Control

Aeration - Dissolved Oxygen Control Challenges:

1. Significant "lag" between process adjustment and measured change
2. Amount of "lag" time changes with many non-controllable parameters (influent load, temperature, hydraulics, SRT, SOUR, Etc.)
3. Effluent Quality highly dependent on stable DO concentration

DO Control Improvements:

1. Operate with very, very slow Integral component
2. Implement multiple T.O.D. "Tuning Factors" based on measured conditions (flow, temp, SRT)
3. Add system which adjusts based on historical data – I.E. Predictive Control

Predictive Control Algorithms How They Work

Uses past collected “historical” data from control database to “predict” what will likely happen next.

From the current measured values and the “Prediction”, a process decision is made by the controller.

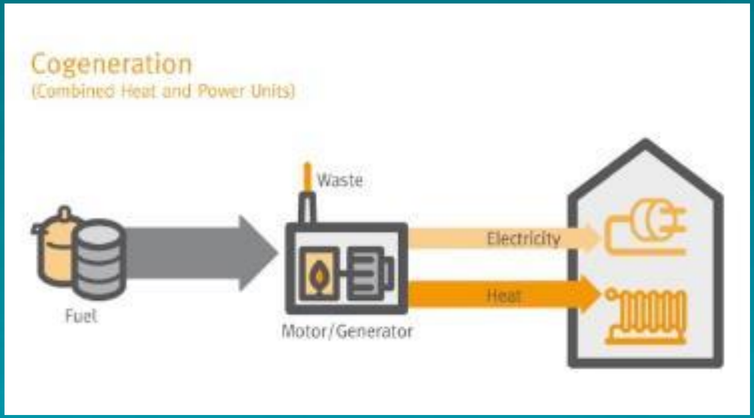
The controller then monitors and records the outcome of the process decision and updates the database for next time.

It’s like having an infinitely variable D (Derivative) component to your PID control function.

Predictive Control Algorithms In Action

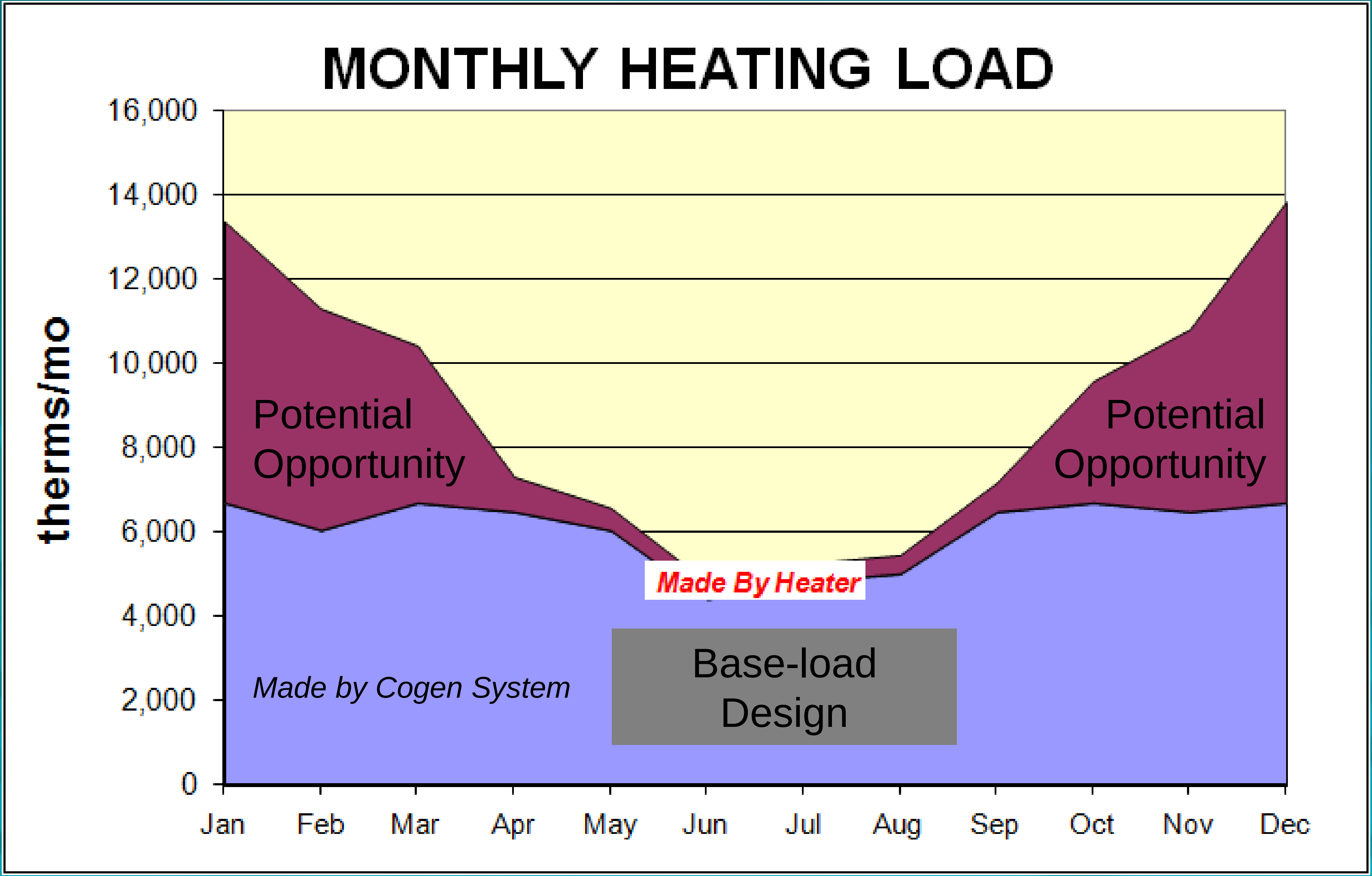
Cogeneration Control Challenges:

1. Utility Export not allowed or not economical
2. Cogeneration System Response is much slower than changes in Building Demands (Electricity & Heat)
3. Building Demands are highly Cyclic and Seasonal (i.e. HVAC)

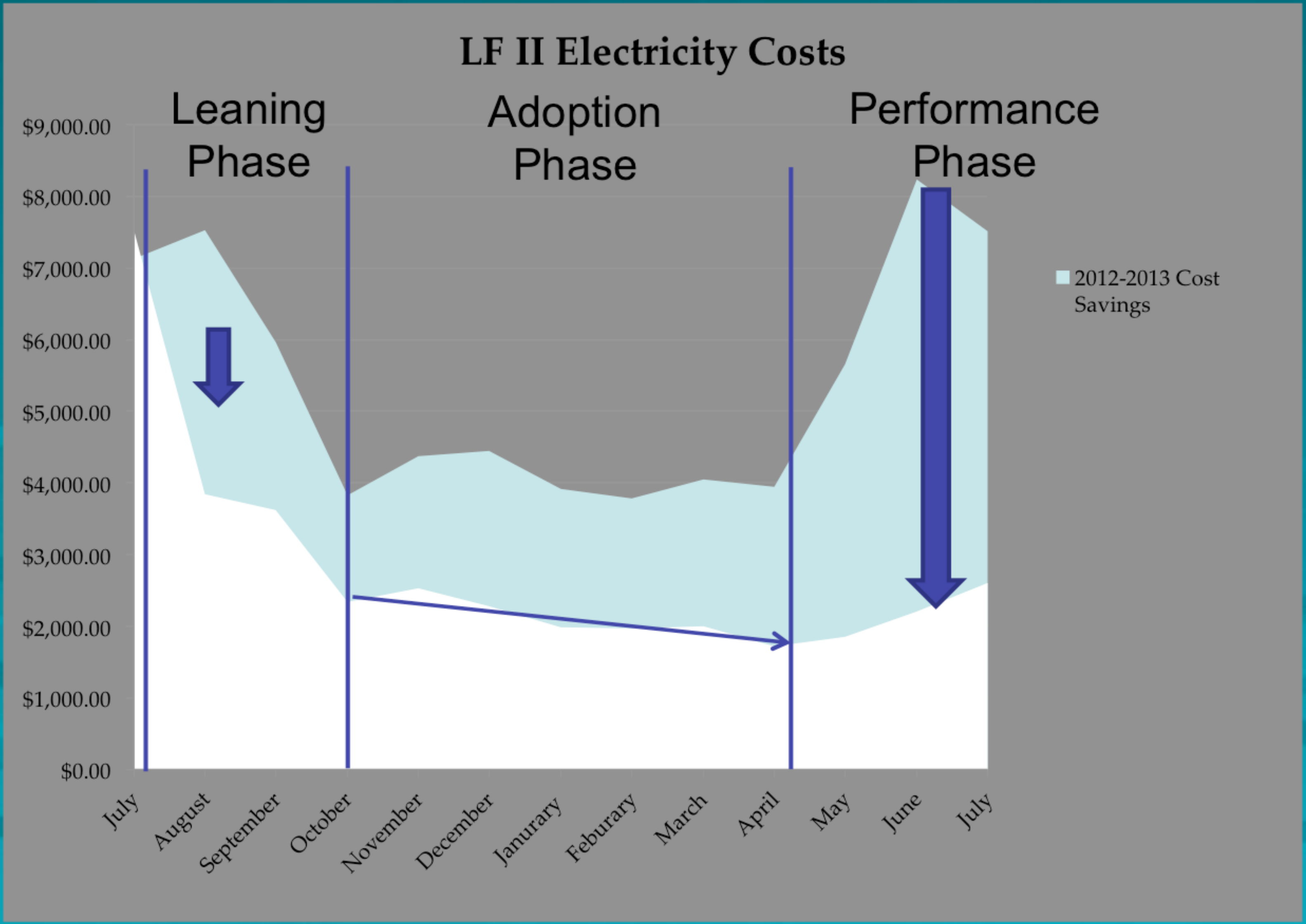


This leads designers to conservatively size system to meet "Base Loading" only and does not allow for Demand Reduction opportunities and savings.

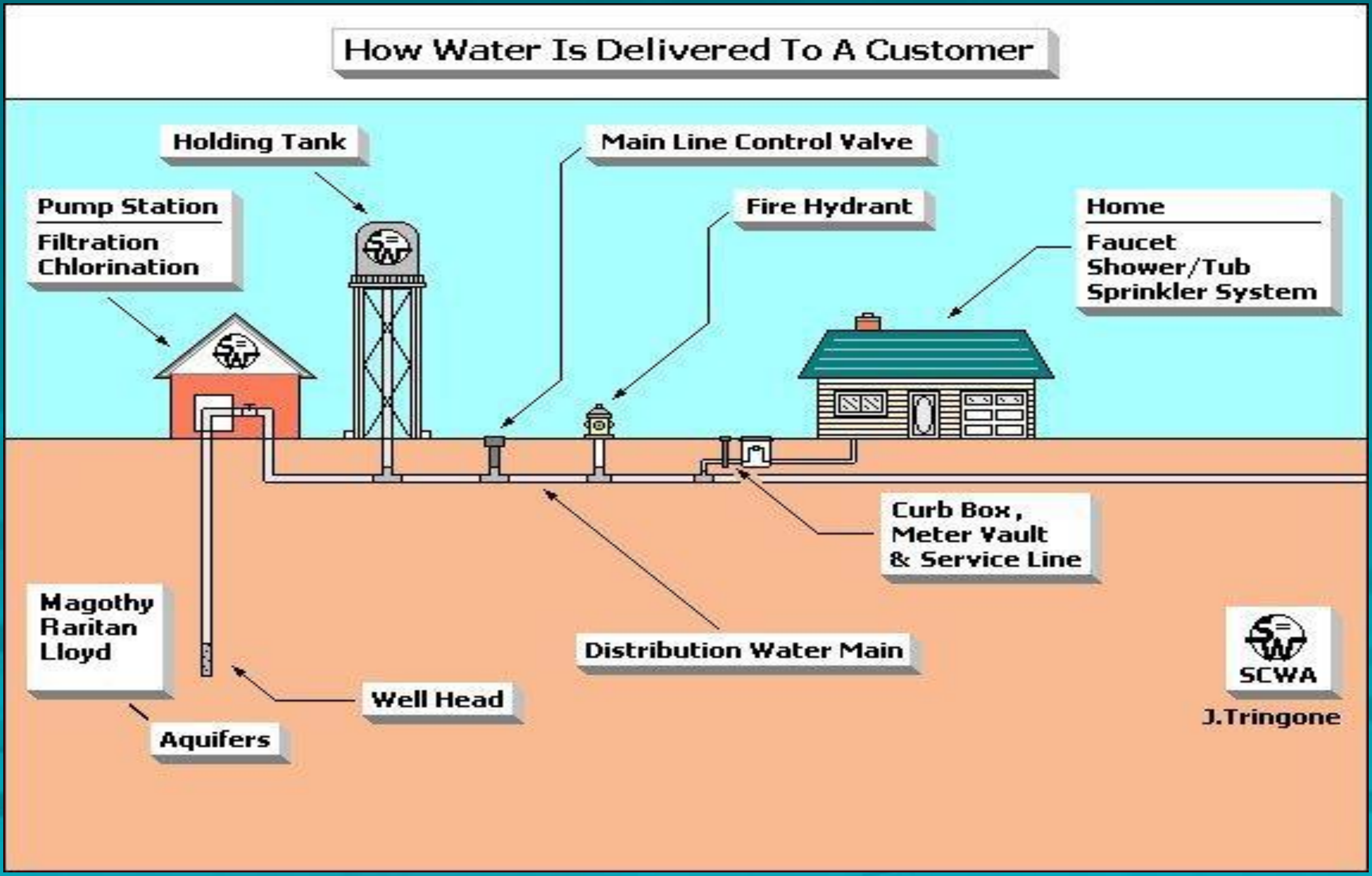
Predictive Control Algorithms In Action



Predictive Control Algorithms In Action



Predictive Control Algorithms In Action



Predictive Control Algorithms In Action

Utilizing Predictive Control:

1. Allows control system to automatically adjust tank operating levels based on historical usage, reducing unnecessary pumping but ensuring enough water for large demand periods (4th of July Weekend, etc.).
2. Allows control system to evaluate pumping efficiencies – real-time and determine which pump(s) are best suited to meet the current and near-term demands.
3. Monitors and controls active pumping rates, using VFDs, to achieve lowest Specific Energy input (kW-hrs. / MG).
4. Can be implemented using existing SCADA system

Summary

- Predictive Control Algorithms provide existing control systems with the ability to think independently of their ladder logic programming, improving system efficiency and reducing operating costs.

Questions?

ENVIRONMENTAL PROCESS LAB

BUBBLES, ENERGY, AND THE POWER BILL: BENCHMARKING AND IMPROVING THE EFFICIENCY OF WASTEWATER AERATION AND OTHER ENERGY-INTENSIVE OPERATIONS IN TREATMENT PROCESSES

Diego Rosso

University of California, Irvine

Lory E. Larson

Southern California Edison

AGENDA

- Introduction
- Wastewater Aeration
- Energy, Costs and Their Dynamics
- Aeration Efficiency Testing
- Benchmarking
- Conclusions

ENERGY, COST, AND THEIR DYNAMICS

WASTEWATER FACILITY ENERGY FOOTPRINT

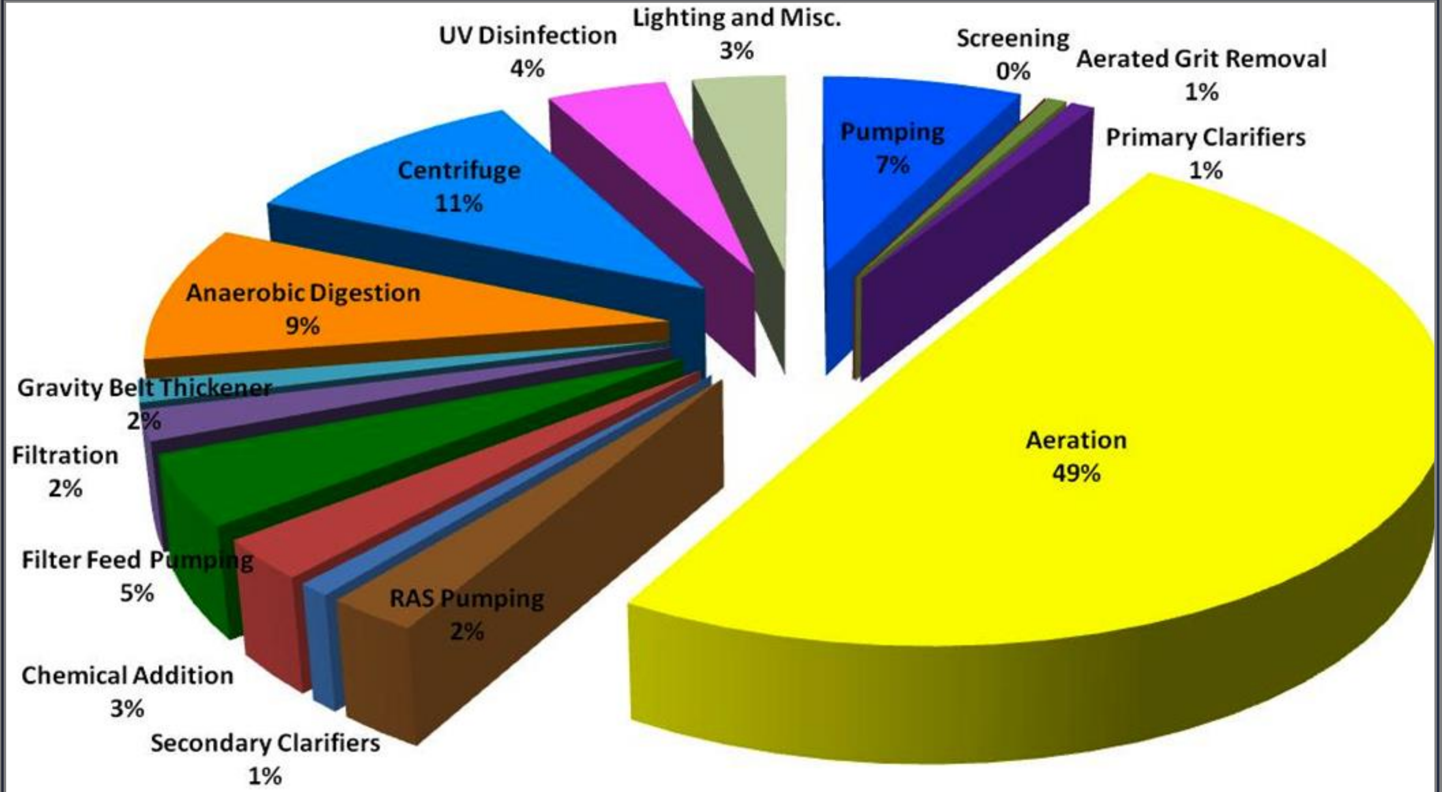


Figure 1. Estimated power usage for a typical 20MGD activated sludge facility performing wastewater treatment with nitrogen removal in the United States (MOP32, 2009).

Aeration cost = 45-75% of plant energy (w/o influent/effluent pumping)

Rosso and Stenstrom (2005) *Wat. Res.* 39: 3773-3780

WASTEWATER AERATION

SOUTHERN CALIFORNIA EDISON

EPL

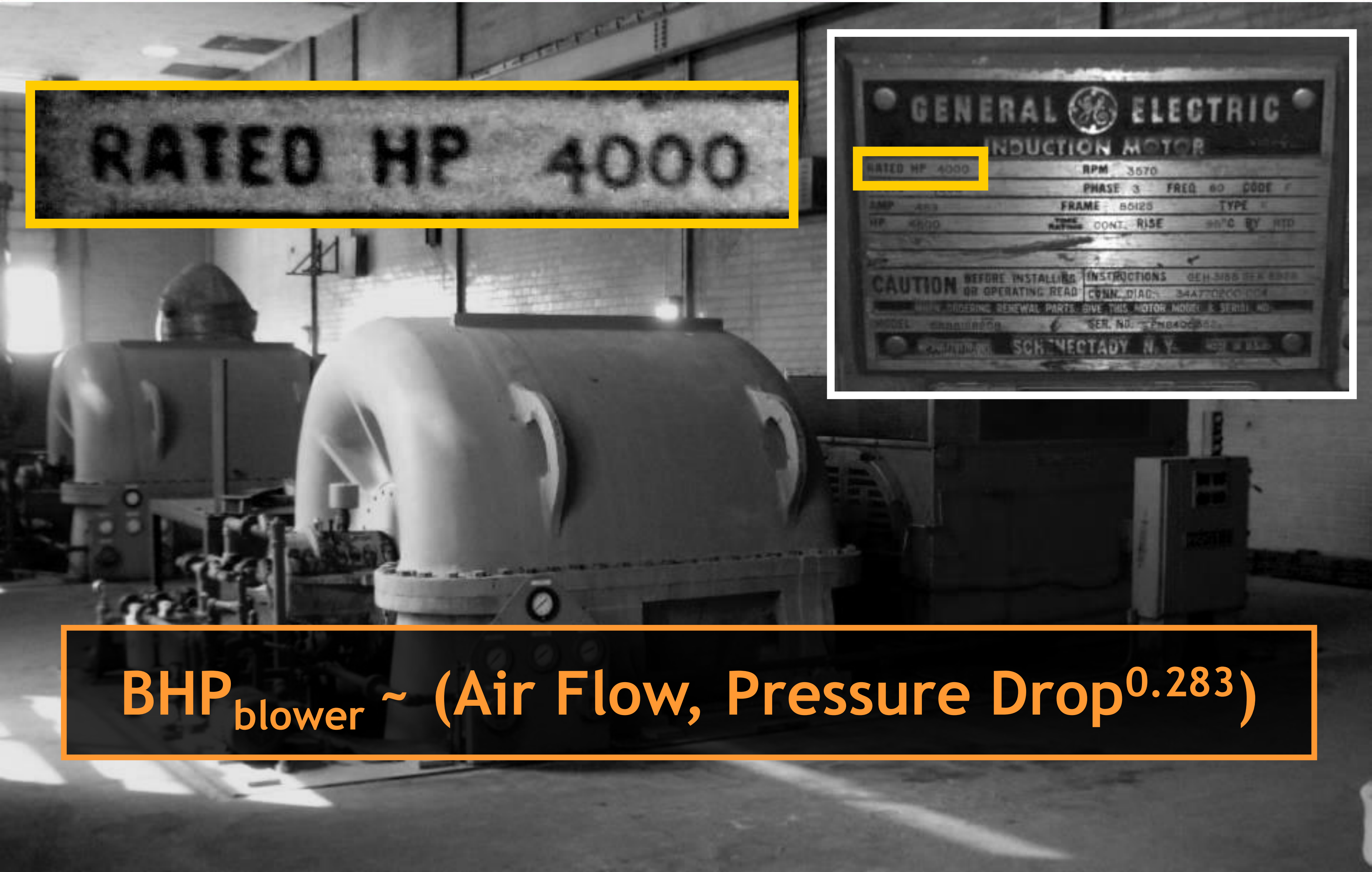
ENVIRONMENTAL PROCESS LAB

BLOWER POWER

SOUTHERN CALIFORNIA EDISON

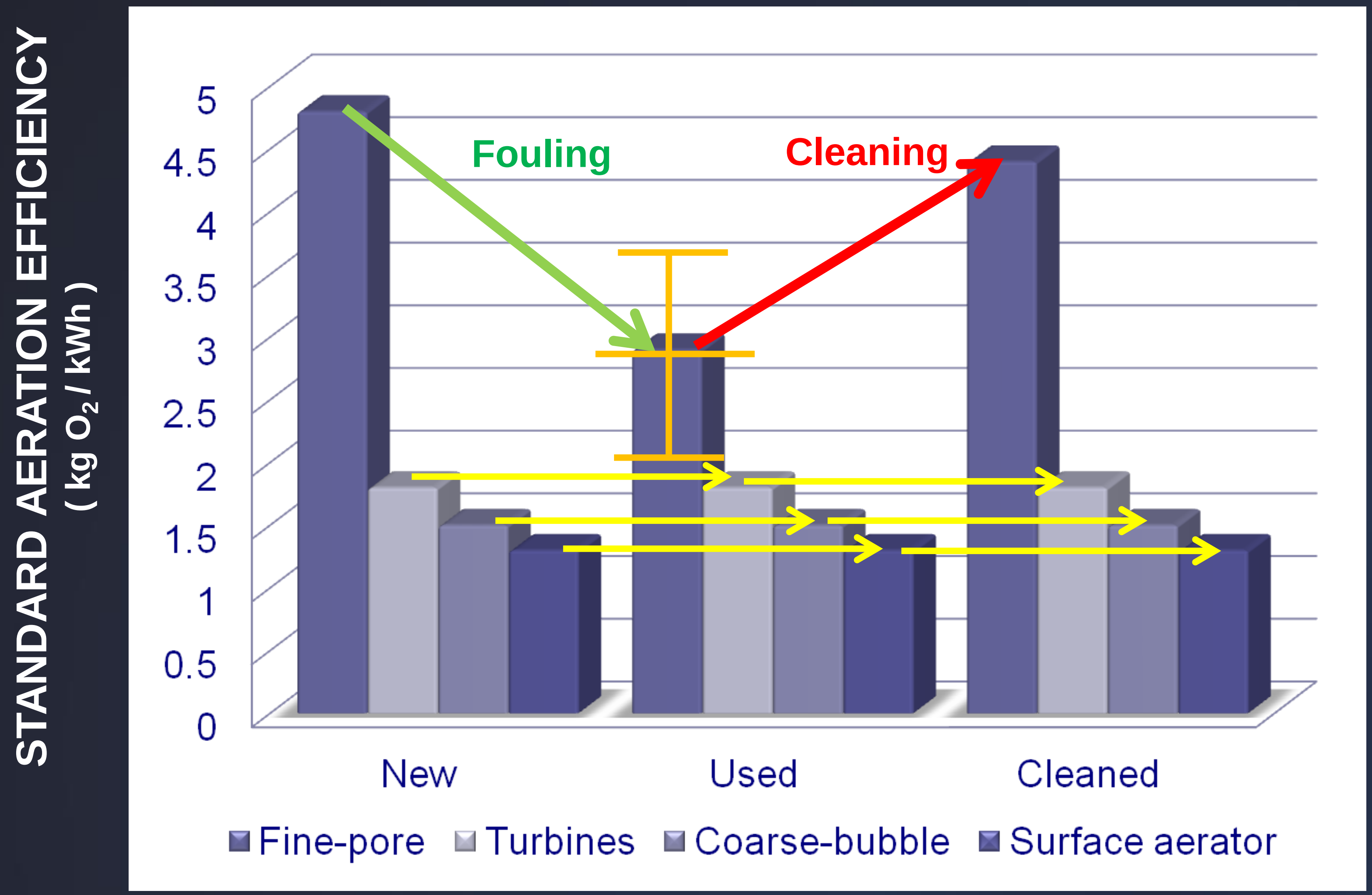
EPL

ENVIRONMENTAL PROCESS LAB



$$BHP_{blower} \sim (\text{Air Flow, Pressure Drop}^{0.283})$$

AERATION EFFICIENCY vs. TIME



After Stenstrom and Rosso (2008)

AERATION OPTIMIZATION

SOUTHERN CALIFORNIA EDISON | EPL | ENVIRONMENTAL PROCESS LAB

- Aeration Efficiency Optimization
  - New Oxygen Transfer Efficiency Analyzers
  - New Aeration Equipment and their Role in Energy Savings
  - New Technology to Optimize Energy Efficiency for the Entire Wastewater Facility

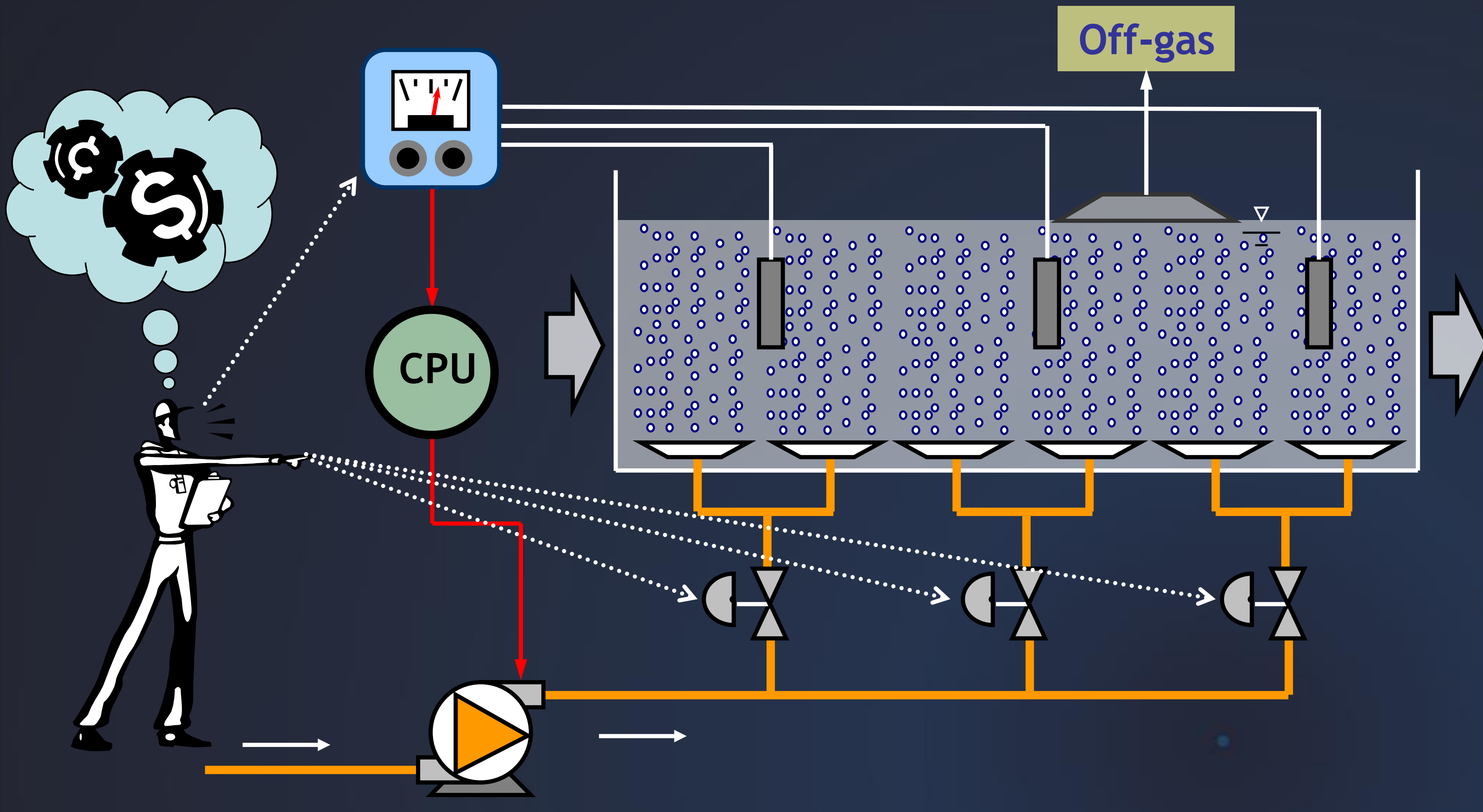
AERATION EFFICIENCY TESTING

AERATION EFFICIENCY TESTING

SOUTHERN CALIFORNIA EDISON

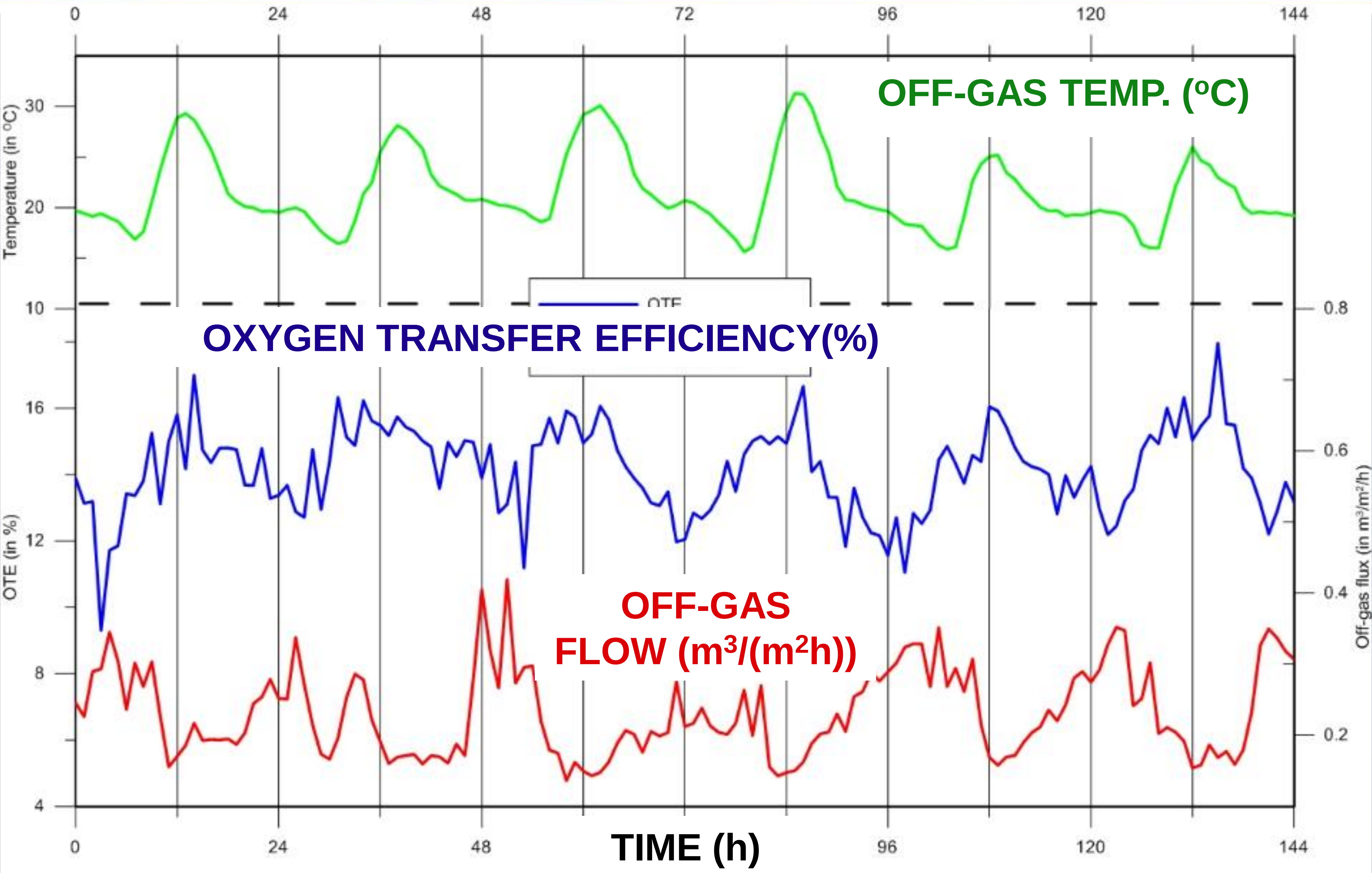
EPL

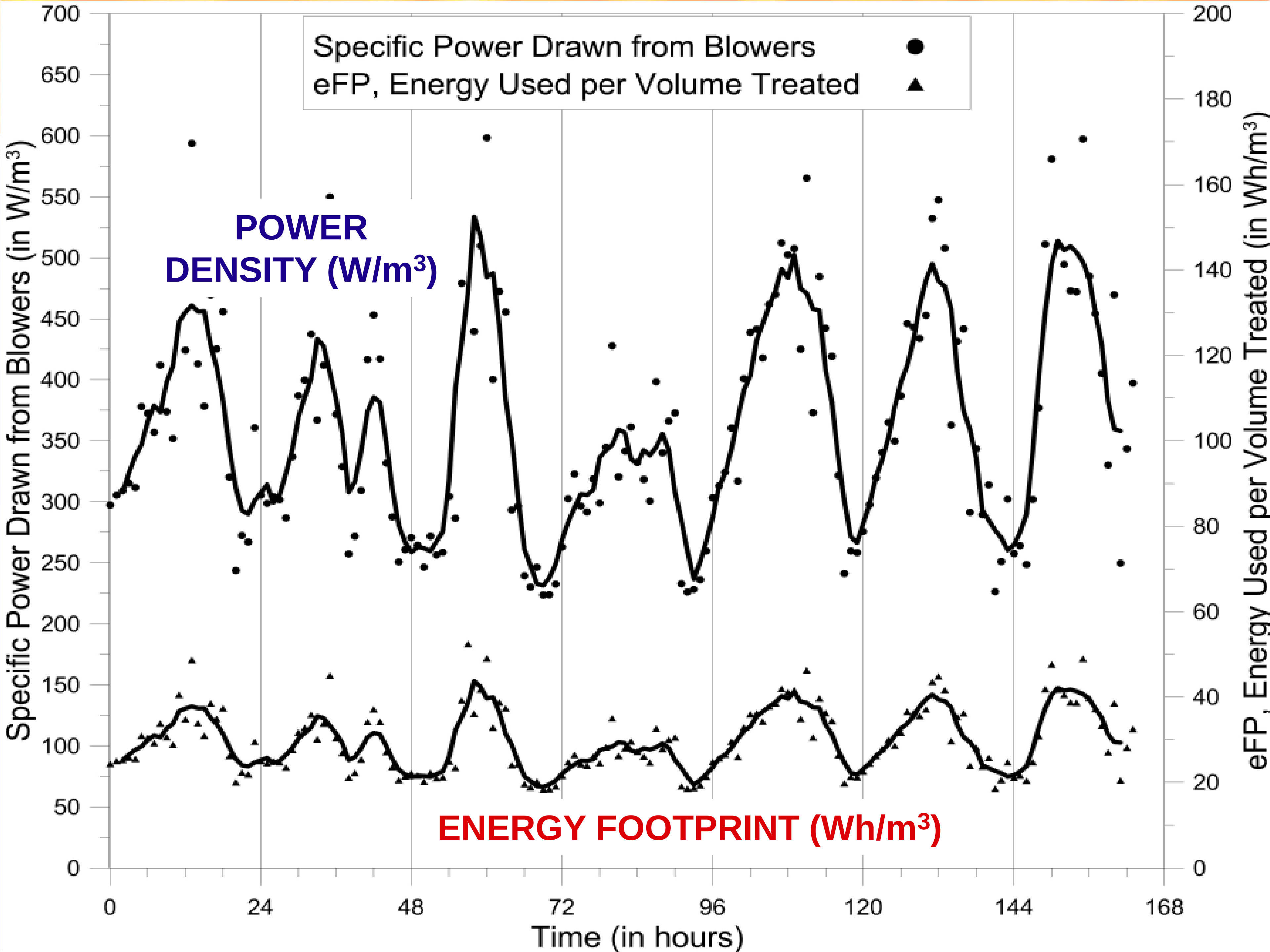
ENVIRONMENTAL PROCESS LAB



O_2 TRANSFER EFFICIENCY ~ 1/COST

ONE WEEK OF MONITORING

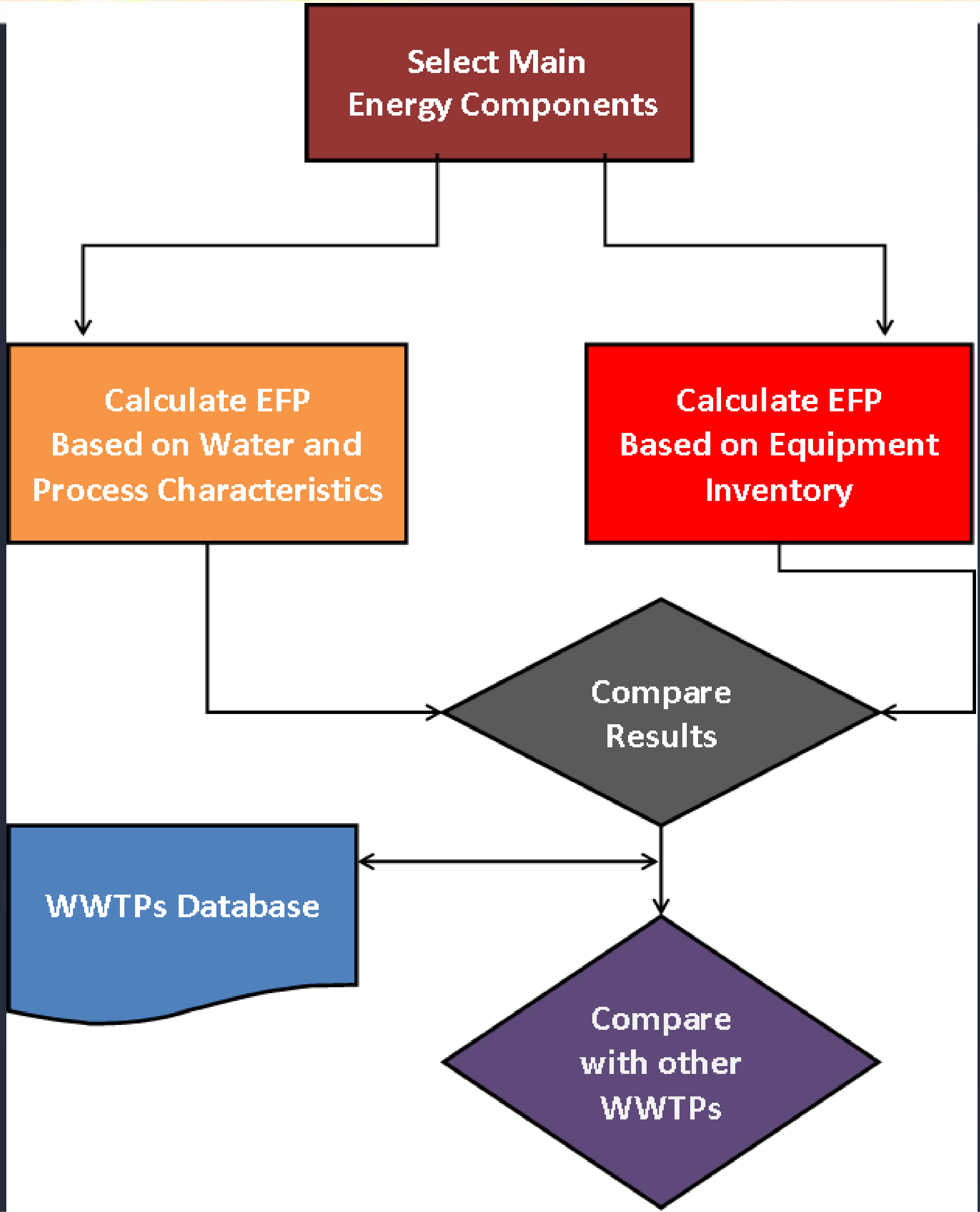




Specific Power Drawn from Blowers
eFP, Energy Used per Volume Treated
POWER DENSITY (W/m³)
ENERGY FOOTPRINT (Wh/m³)
Specific Power Drawn from Blowers (in W/m³)
eFP, Energy Used per Volume Treated (in Wh/m³)
Time (in hours)
0
24
48
72
96
120
144
168
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
0
20
40
60
80
100
120
140
160
180
200

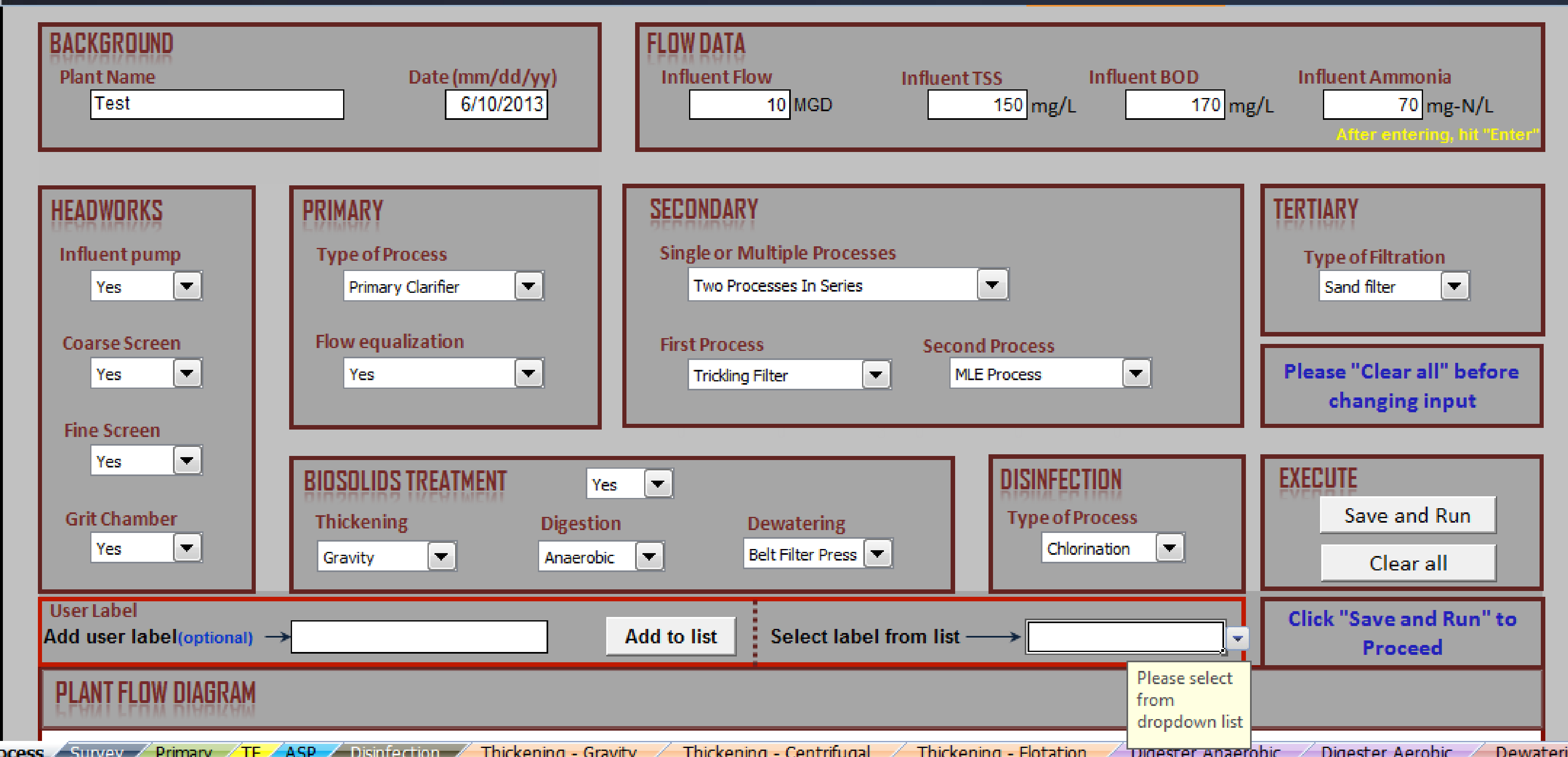
BENCHMARKING PROCESS ENERGY

WHY BENCHMARKING?

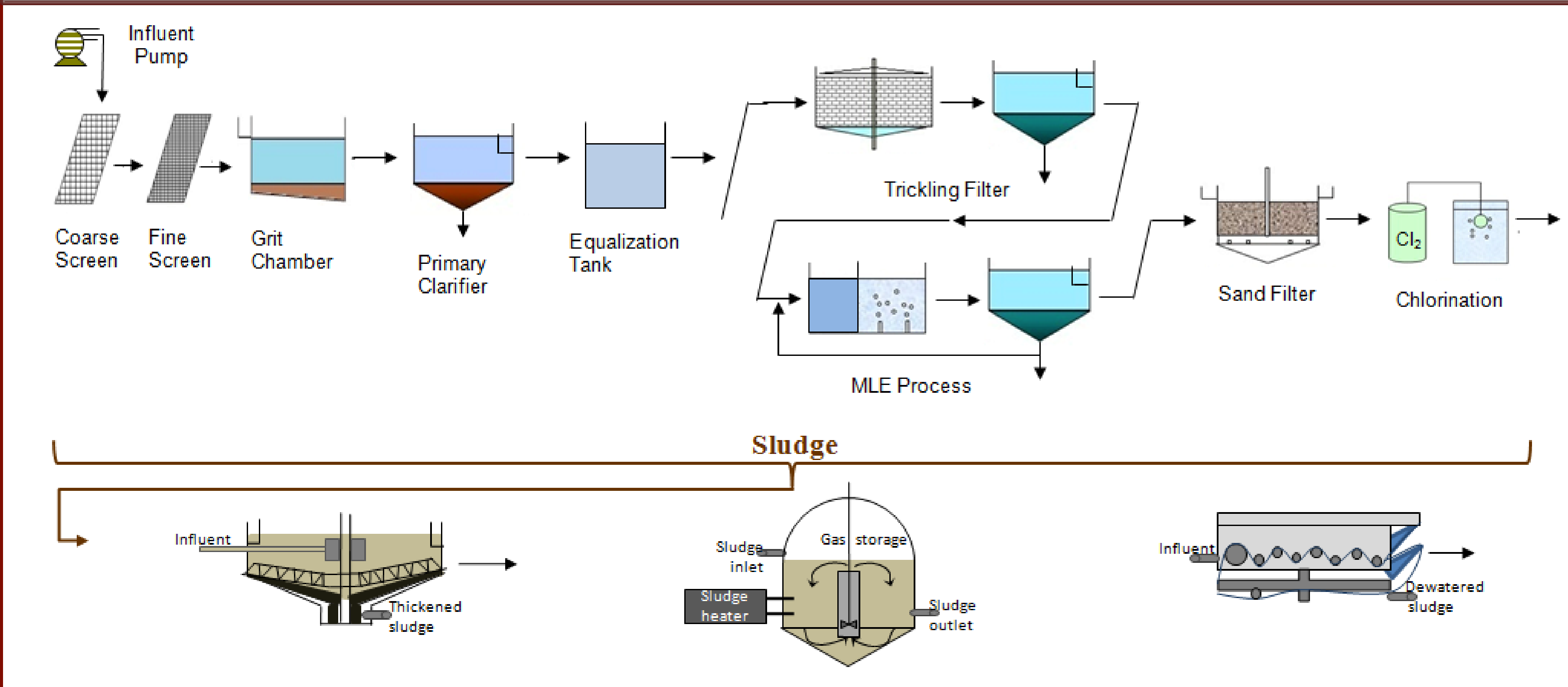


Objectives of Benchmarking Software

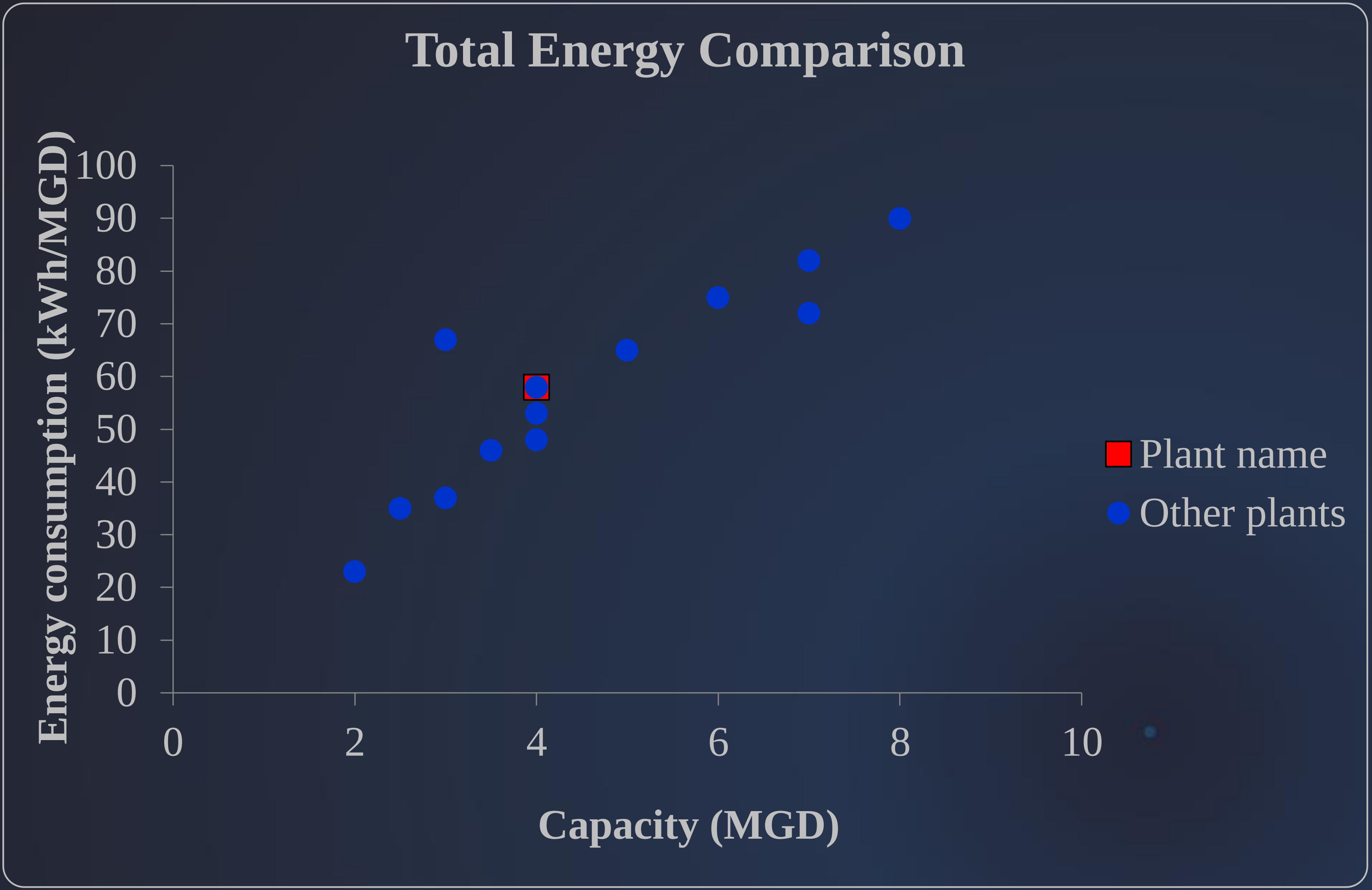
- Calculate energy consumption of each unit process based on:
  - Process parameters
  - Equipment inventory
  - Literature review (for comparison)
  - BOD/NH_4-N/TSS/flow treated for the unit process
- Record user data and calculated energy consumption in main database
- Plot, Analyze and Compare with other plant data
- Enable user to compare energy consumption for different measures/consultants(labeled by user)



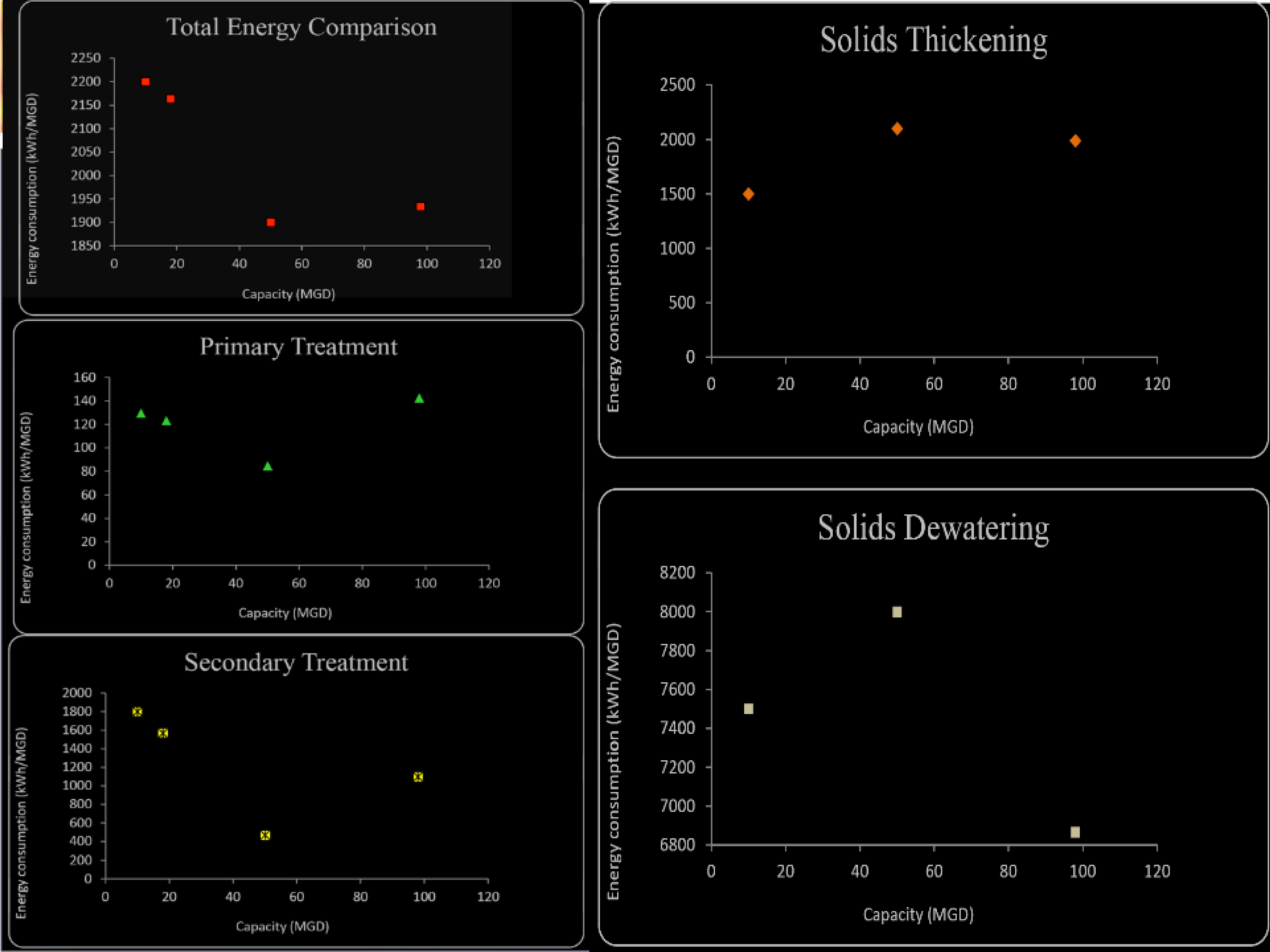
BACKGROUND
Plant Name
Test
Date (mm/dd/yy)
6/10/2013
FLOW DATA
Influent Flow
10 MGD
Influent TSS
150 mg/L
Influent BOD
170 mg/L
Influent Ammonia
70 mg-N/L
After entering, hit "Enter"
HEADWORKS
Influent pump
Yes
Coarse Screen
Yes
Fine Screen
Yes
Grit Chamber
Yes
PRIMARY
Type of Process
Primary Clarifier
Flow equalization
Yes
SECONDARY
Single or Multiple Processes
Two Processes In Series
First Process
Trickling Filter
Second Process
MLE Process
TERTIARY
Type of Filtration
Sand filter
Please "Clear all" before changing input
BIOSOLIDS TREATMENT
Yes
Thickening
Gravity
Digestion
Anaerobic
Dewatering
Belt Filter Press
DISINFECTION
Type of Process
Chlorination
EXECUTE
Save and Run
Clear all
User Label
Add user label (optional)
Add to list
Select label from list
Click "Save and Run" to Proceed
Please select from dropdown list
PLANT FLOW DIAGRAM
Survey
Primary
TF
ASP
Disinfection
Thickening - Gravity
Thickening - Centrifugal
Thickening - Flotation
Digester Anaerobic
Digester Aerobic



ocess | Survey | Primary | TF | ASP | Disinfection | Thickening - Gravity | Thickening - Centrifugal | Thickening - Flotation | Digester Anaerobic | Digester Aerobic | Dewatering



Total Energy Comparison
Energy consumption (kWh/MGD)
100
90
80
70
60
50
40
30
20
10
0
0
2
4
6
8
10
Capacity (MGD)
Plant name
Other plants


Total Energy Comparison
Energy consumption (kWh/MGD)
2250
2200
2150
2100
2050
2000
1950
1900
1850
0 20 40 60 80 100 120
Capacity (MGD)
Primary Treatment
Energy consumption (kWh/MGD)
160
140
120
100
80
60
40
20
0
0 20 40 60 80 100 120
Capacity (MGD)
Secondary Treatment
Energy consumption (kWh/MGD)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0 20 40 60 80 100 120
Capacity (MGD)
Solids Thickening
Energy consumption (kWh/MGD)
2500
2000
1500
1000
500
0
0 20 40 60 80 100 120
Capacity (MGD)
Solids Dewatering
Energy consumption (kWh/MGD)
8200
8000
7800
7600
7400
7200
7000
6800
0 20 40 60 80 100 120
Capacity (MGD)

CONCLUSIONS

CONCLUSIONS

- Aeration system is the prime energy consumer in wastewater treatment
- Real-time efficiency analyzers are available
- Dynamic observations necessary for highest energy savings and peak-power demand reduction
- Long-term studies quantify fouling effects and cleaning schedules
- Benchmarking empowers end-users to track energy usage and to identify priorities for improvement

URBAN
WATER
RESEARCH
CENTER

ENVIRONMENTAL PROCESS LAB

EPL

SOUTHERN CALIFORNIA EDISON

Diego Rosso, Reza Sobhani, Matthew K. Jeung
University of California, Irvine
Lu-Man Jiang
Shanghai University of Electric Power
Lory E. Larson
Southern California Edison
Michael K. Stenstrom, Ben Li, Kartiki Naik
University of California, Los Angeles
Shao-Yuan Ben Leu
Honk Kong University of Technology

DIEGO ROSSO
bidui@uci.edu
www.epl.eng.uci.edu

LORY E. LARSON
Lory.larson@SCE.com

RESEARCH SPONSORED BY SOUTHERN CALIFORNIA EDISON AND THE CALIFORNIA ENERGY COMMISSION
THANKS TO: IRWD, SIMI VALLEY, OCSD, LACSD

REFERENCES

Gillot et al (2005) *Chem. Eng. Sci.*. 60 6336-6345
Krause et al (2003) *Wat. Sci. Tech.* 47(12) 169-176
Libra et al (2002) *Wat. Sci. Tech.* 46(4-5) 317-324
Leu et al (2009) *Wat. Env. Res.* 81, 2471-2481
Reardon, D. (1995) *Civ Eng* 65(8) 54-56
Redmon (1983) *Jo. WPCF* 55(11) 1338-1347
Rosso and Stenstrom (2006) *Wat. Environ. Res.* 78(8) 810-815
Rosso et al (2011) *Wat. Res.* 45 5987-5996
Stenstrom et al (2008) *Wat. Environ. Res.* 80(7) 663-671
Trillo et al (2004) *Proc. WEFTEC 2004* 91-95 27-45
Rosso et al (2012) Wat. Sci. Technol. 66(3) 627-634
Howard (2012) Proc. WEFTEC

From Smart Gas to the Cloud, Where to Next?

Moving the Needle in Industrial Efficiency

ETCC Quarterly Meeting

December 10, 2014

Dr. Angela Shih, Professor and Chair

Mechanical Engineering Department

California State Polytechnic University, Pomona

Mechanical Engineering

- Currently has about 1300 graduate and undergraduate students
- One of the largest mechanical engineering programs on the West Coast
- “learn-by-doing” philosophy

Current Technology

- Internet-based
- Hourly rate
- Household/company meter/submeter level
- Analog meter + communication device
- Data Analytics

Constraints

- No controller
- Measurement Techniques
- Bandwidth/Storage requirements for Data
- Performing timely data analysis for feedback
- Accuracy and Sustainability
- Price

Disruptive Innovation

"Generally, disruptive innovations were technologically straightforward, consisting of off-the-shelf components put together in a product architecture that was often simpler than prior approaches. They offered less of what customers in established markets wanted and so could rarely be initially employed there. They offered a different package of attributes valued only in emerging markets remote from, and unimportant to, the mainstream." – Clayton Christensen

Christensen, Clayton M. (1997), *The innovator's dilemma: when new technologies cause great firms to fail*, Boston, Massachusetts, USA: Harvard Business School Press, ISBN 978-0-87584-585-2

NEST

Tech Specs

Display

Height: 28.0mm / 1.10"
Mass: 254 g / 9.0 oz
Diameter: 83mm / 3.27"

Wireless

Wifi - 802.11b/g/n @ 2.4GHz
Nest Weave - 802.15.4 @ 2.4GHz

Show detailed specs +

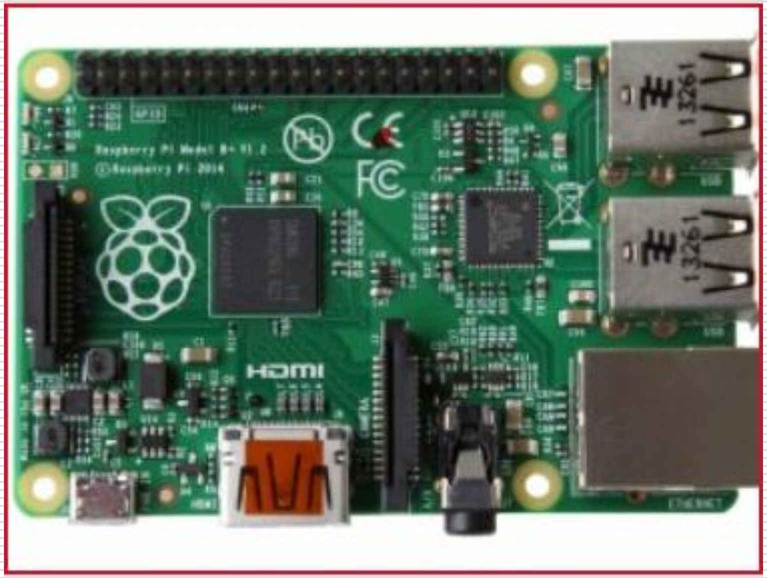
https://store.nest.com/product/thermostat/

Raspberry Pi – Credit-Card Sized Computer

WHAT IS A RASPBERRY PI?

The Raspberry Pi is a low cost, **credit-card sized computer** that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python. It's capable of doing everything you'd expect a desktop computer to do, from browsing the internet and playing high-definition video, to making spreadsheets, word-processing, and playing games.

What's more, the Raspberry Pi has the ability to interact with the outside world, and has been used in a wide array of digital maker projects, from music machines and parent detectors to weather stations and tweeting birdhouses with infra-red cameras. We want to see the Raspberry Pi being used by kids all over the world to learn to program and understand how computers work.



http://www.raspberrypi.org/

Raspberry Pi Data Logger

Raspberry Pi board + I2C temperature sensor, SD card for data storage downloadable to excel.

http://www.instructables.com/id/Raspberry-Pi-Temperature-Logger/

MEMS (MicroElectroMechanical) Sensors

- Sample flow sensor, www.digikey.com

Sensing Range	0 ~ 3 m/s
Flow Sensor Type	Air
Voltage - Input	3.15 V ~ 9.45 V
Port Size	2mm x 3mm

Image shown is a representation only. Exact specifications should be obtained from the product data sheet.

Where to?

- Smaller and smarter
- Cheaper
- Cloud-based
- Big Data analytics

Real-time Data and Analytical Models

- Combustion efficiency models – commercial and industrial applications
- Engineering Economics
- Smart delivery network
- Leak detection
- Feedback and control

Thank you!

Dr. Angela Shih

acshih1@csupomona.edu

Dr. Henry Xue

HXue@csupomona.edu

Operational Efficiency Through Energy

10 December, 2014

INDUSTRIAL ENERGY MUST BE IMPROVED

Operational excellence unleashed by lightapp energy intelligence solutions

"Operational Excellence is an element of organizational leadership that stresses the application of a variety of principles, systems, and tools toward the sustainable improvement of key performance metrics."

source: wikipedia

lightapp

INDUSTRY 4.0

1.0 | 1784 | based on mechanical production equipment driven by water and steam power

2.0 | 1870 | based on mass production enabled by the division of labor and the use of electrical energy

3.0 | 1969 | based on the use of electronics and IT to further automate production

4.0 | tomorrow | based on the use of cyber-physical systems

SAME SAME

INDUSTRY 4.0

Factories of the Future

Smart Factories

The Market shifts - why now?

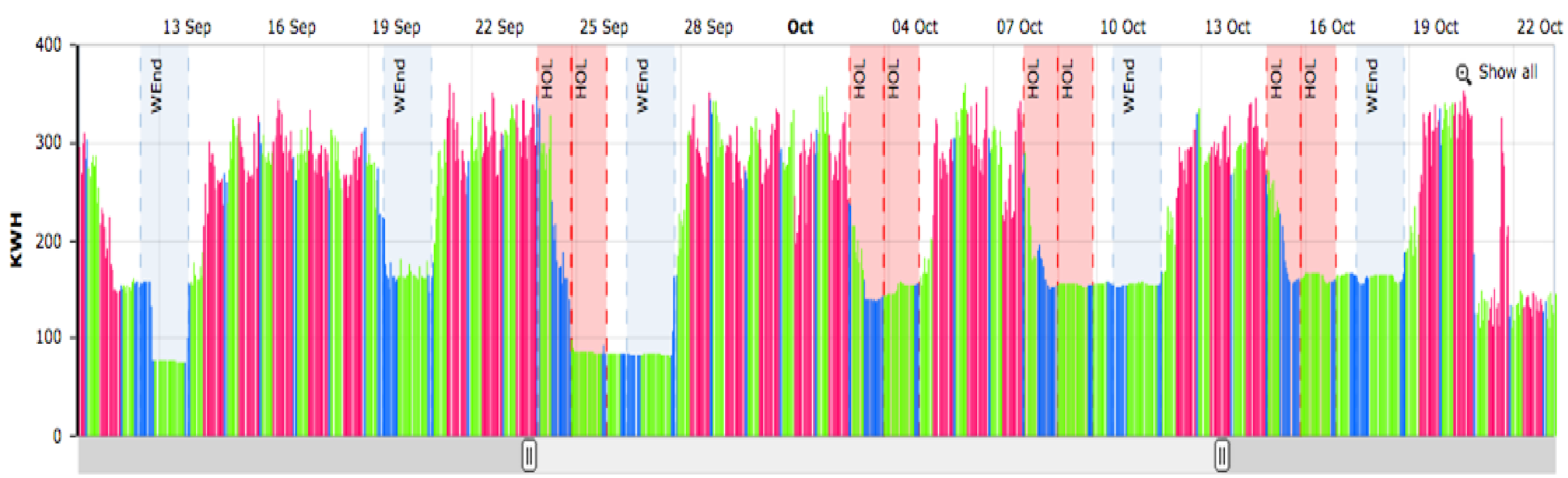
- Industrial **Internet-of-things** revolution
- Lower cost of **smart devices**
- Acceptable **cloud deployments**
- **Intersection** of people, data and intelligent machines

Energy Measurements

Summary

Average rate	Hourly Max	Daily Average	Total Cost	Total Consumption
0.419	386.5 KWH 2014-08-26 05:00:00	5,023 KWH	191,666 NIS	457,101 KWH

Consumption by TOU



Energy Intensity

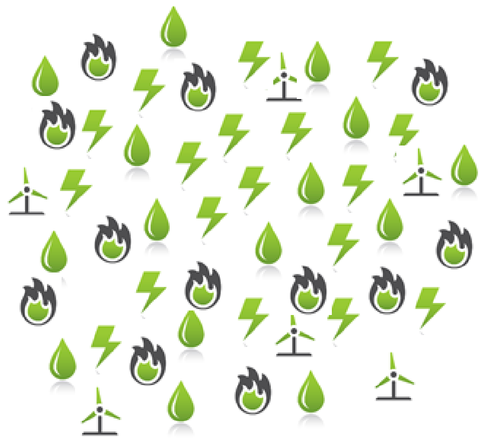
Pages > Production KPI details

lightapp

The need

Data Collection in real-time from a variety of sources

PHYSICAL

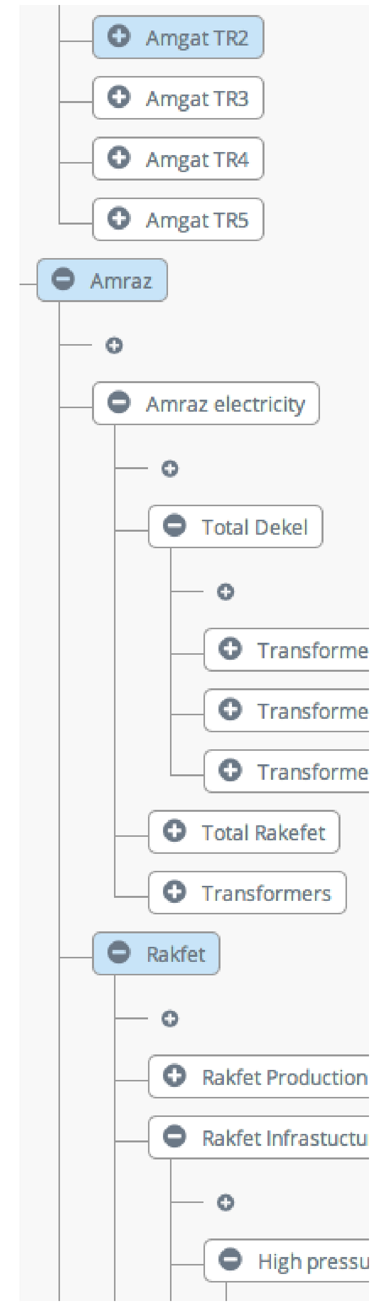


INTERNAL

Schneider Electric
Honeywell
ABB
SAP
infor
ORACLE
movex
Rockwell Automation
Danfoss

EXTERNAL

lightapp



Advanced Research in CA

Unlocking Industrial Energy Efficiency with Energy Management Systems

Partners: Berkeley University of California; Massachusetts Institute of Technology; The University of Chicago

Funding: Applying to CEC PON, Through EPIC

Scope: 100+ Large Industrial facilities

Compressed air systems

Attractive customer value proposition

Project goals

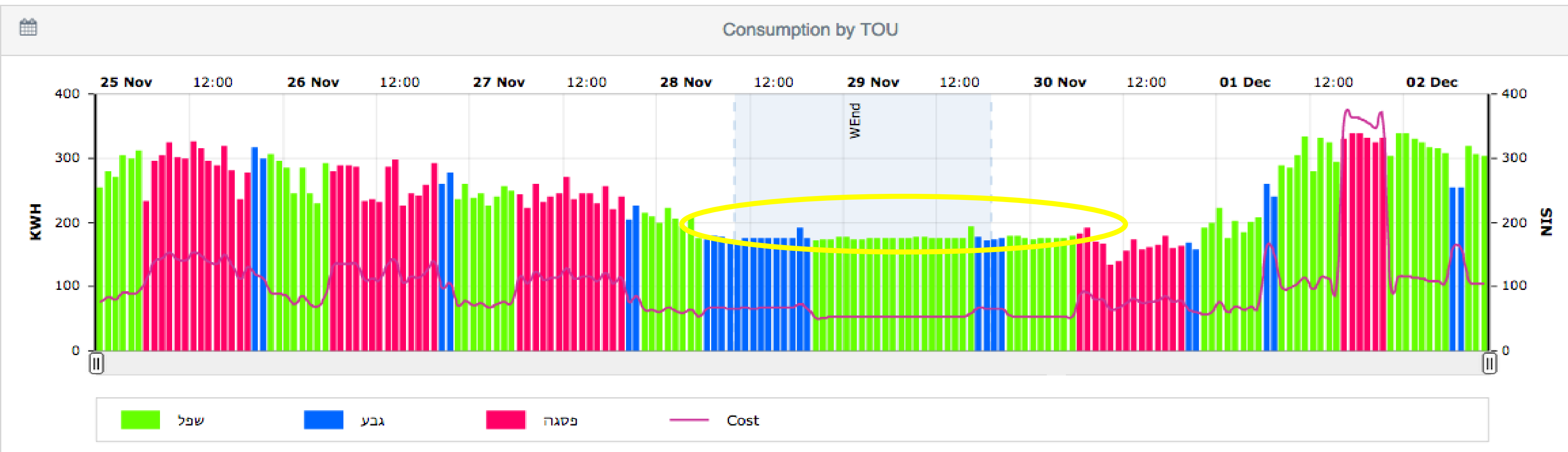
- **Understand market potential for industrial energy management systems**
  - Are some sectors more interested than others?
  - Are new facilities more interested than old? Big more than little?
- **Understand the impact of energy management systems on:**
  - Energy consumption of compressed air systems
  - Energy consumption at the whole facility
  - Participation in utility energy efficiency programs
  - Management actions to improve energy usage (making operational changes, initiating investments in maintenance and equipment, etc).

Identifying leaks

Configuration: Electricity Meter

Finding out compressed system base load while the factory is not manufacturing.

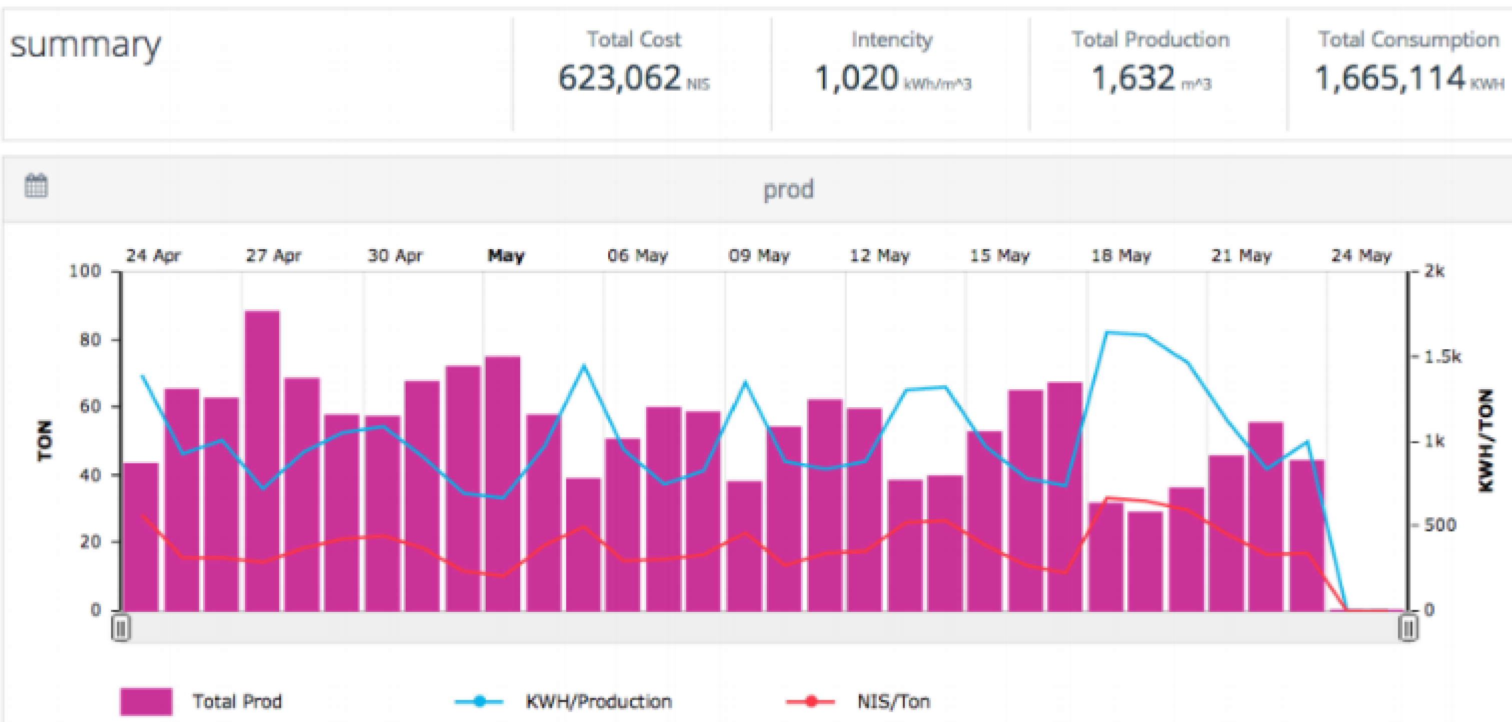
Summary	Average rate	Hourly Max	Daily Average	Total Cost	Total Consumption
	0.413	339.1 KWH 2014-12-01 23:00:00	5,239 KWH	17,301 NIS	41,912 KWH



Creating the facility benchmark

Configuration: Electricity Meter, Production data

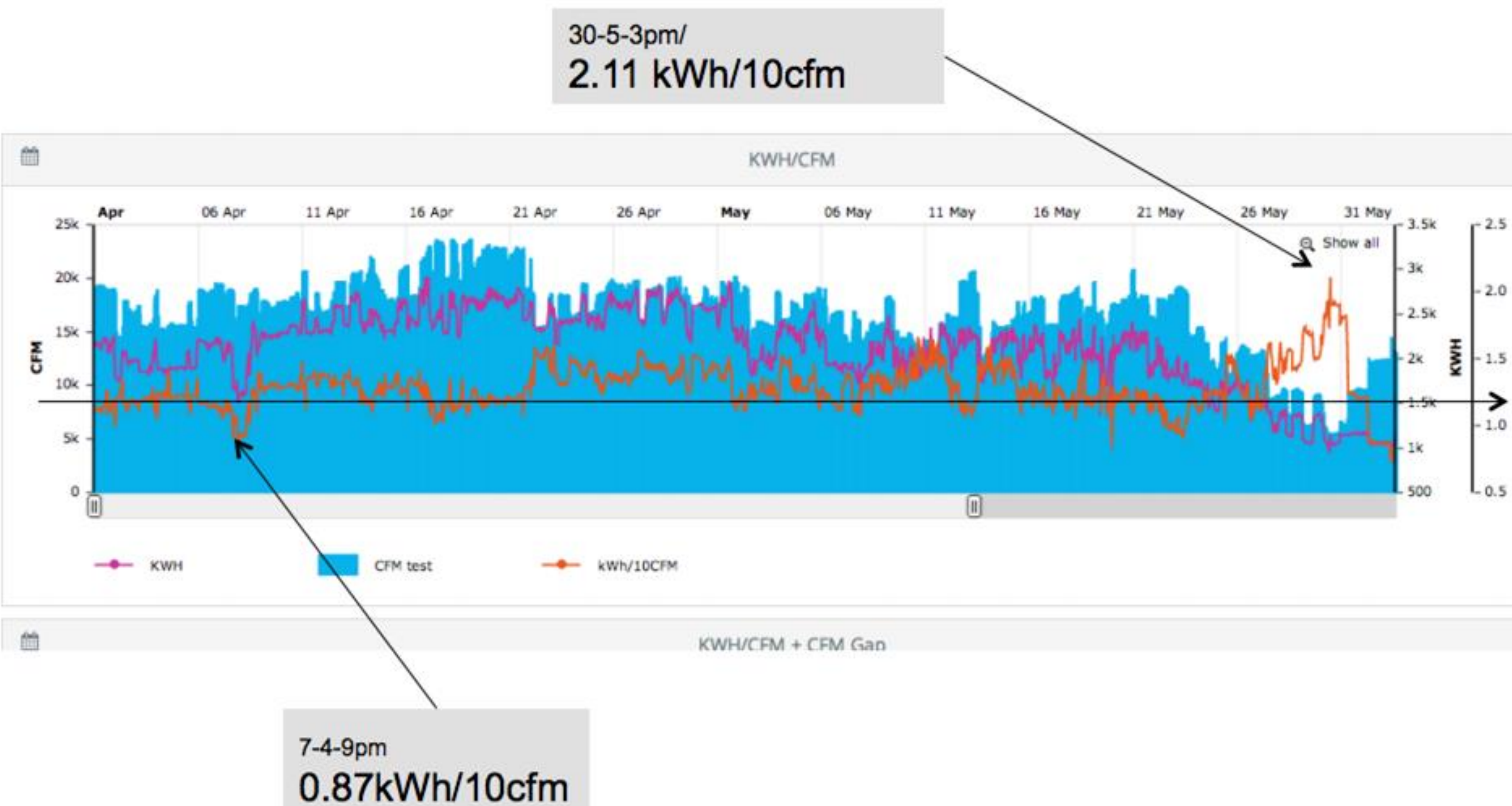
Identify best and worst case energy intensity consumption and alert management to it. In this case 100% difference between days



Cross Industry Benchmark

Configuration: Electricity Meter, Flow Meter, Production data

kWh/10 CFM (@specific pressure). Enables decisions about how to optimize the compressed air array



Exposing equipment / Maintenance malfunction

Configuration: Electricity Meter, Pressure Sensors

- ❏ Compressed air needs are served. No one is complaining.
- ❏ Still, the equipment is wasting a lot of energy.

In this chart, Pressure before and after the dryer

lightapp

Energy Intensity

greentechefficiency:

The 50-Kilowatt Initiative: Should We Set Metering Standards on Industrial Equipment?

Boaz Ur of Lightapp proposes a unique law to encourage a smarter, more efficient industrial sector.

Boaz Ur
May 15, 2014

http://www.greentechmedia.com/articles/read/the-50-kilowatt-initiative

Thank You

boazur@lightapp.com

EMERGING TECHNOLOGIES PROGRAM SUPPORT OF INDUSTRIAL SECTOR

Panelists

Rory Cox, Regulatory Analyst | California Public Utilities Commission

Abdullah Ahmed, Manager, Emerging Technologies Program | Southern California Gas

Edwin Hornquist, Manager, Emerging Technologies Program | Southern California Edison

Mangesh Basarkar, Manager, Emerging Technologies Program | Pacific Gas and Electric Company

Kate Zeng, Manager, Emerging Technologies Program | San Diego Gas & Electric

Bruce Baccei, Project Manager, Energy Efficiency & Renewables | Sacramento Municipal Utility District

Virginia Lew, Energy Efficiency Research Office Manager | California Energy Commission

Moderator

Jonathan Livingston, Principal | Livingston Energy Innovations

CALIFORNIA PUBLIC UTILITIES COMMISSION

Rory Cox

CA | Energy Efficiency Strategic Plan

Update on the 2015 Strategic Plan Update – Industrial Chapter

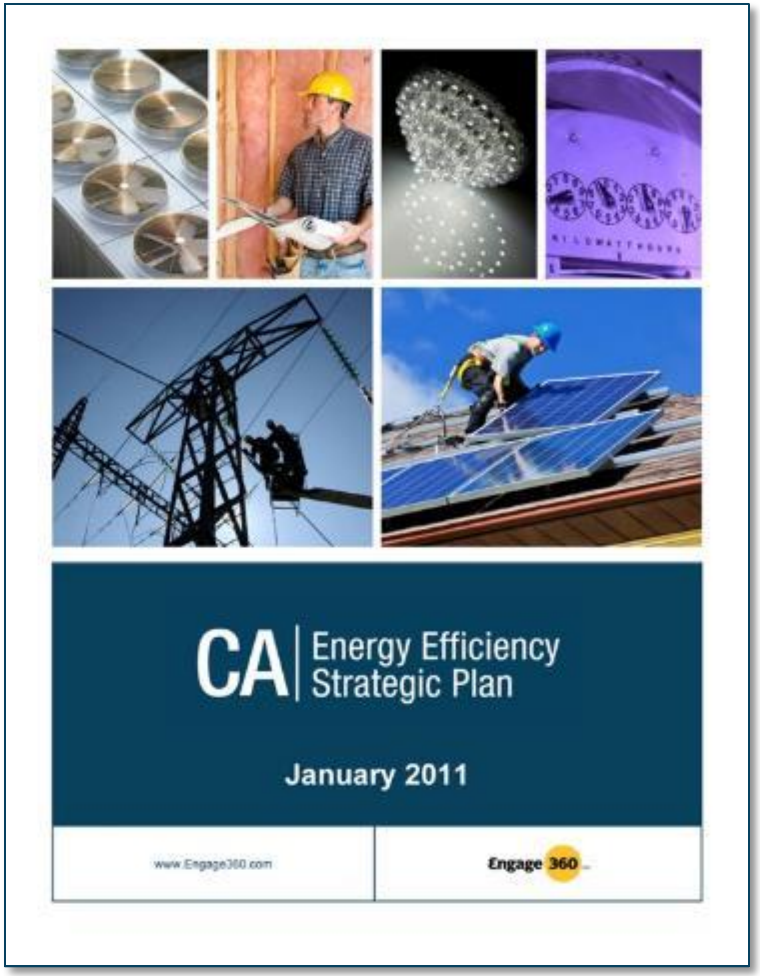
Emerging Technology Coordinating Council

December 10, 2014

Strategic Plan: Big Ideas

CA | Energy Efficiency Strategic Plan

- Adopted in 2008 to achieve all potential energy savings
- Strategies for 2030
- Designed to think beyond 2 to 3 year portfolios
- Guidance for a budget of approx $1 billion



Updating the Strategic Plan

CA | Energy Efficiency Strategic Plan

Re-thinking the Plan to Reflect Regulatory Changes

1. **Changes in Energy Efficiency Programs – Rolling Portfolio Cycle Proposal**

2. **Integrated Demand Side Management OIR**
    a. **Energy Efficiency**
    b. **Demand Response**
    c. **Customer-owned generation**
    d. **Electric Vehicles**
    e. **Energy Storage**
    f. **Rates**
    g. **Smart Grid**

Updating the Strategic Plan

CA Energy Efficiency Strategic Plan

Chapters

1. The 2014 Vision
2. New Buildings
3. Existing Buildings
4. Local Government
5. Industrial

Metrics

1. Energy Savings
2. GHG Reductions (towards 2050 goals)
3. Cost Effectiveness

Industrial

If you've seen one industrial facility….

…you've seen one industrial facility!

Current Industrial Program categories

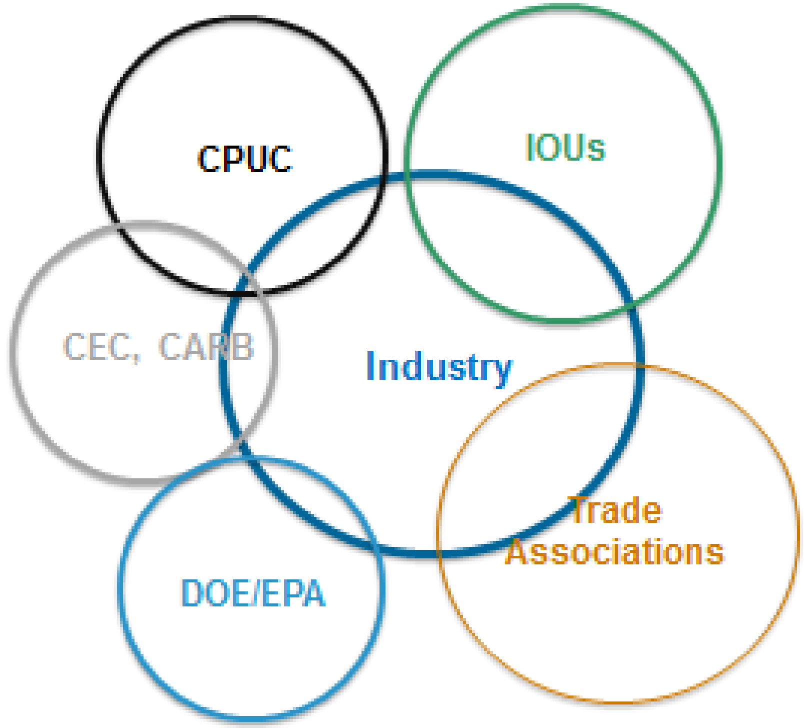
- Energy Advisor
- Calculated Savings
- Deemed Incentives
- Continuous Energy Improvement
- Third Party Programs

Other Non-EE opportunities

- Self generation (CHP, renewable)
- Water reduction strategies
- Demand Response

Industrial stakeholder outreach

- IOU Staff
- Industry associations (Manufacturers, Food Processors, Plastics, Technology)
- Other agencies (CARB, CEC, EPA)
- 3 Industrial consultations in Downey and Stockton



Industrial

CA | Energy Efficiency Strategic Plan

Key Input from Customers (thus far)

- Better, simplified access to program information for all demand side programs (EE, DR, DG)
- Greater access to technical/financial energy management resources (e.g.- web-based training, metering, new technologies, cost/benefit info)
- Networking/information sharing opportunities
- Improved coordination between regulatory agencies, reduce regulatory uncertainty
- Better quality energy audits and technical services

Vision & Mission- Draft 2014 Revised

Vision: California industries are more economically competitive through the adoption of integrated energy solutions.

Mission: Through programs, policies and other strategies, strengthen California by empowering industry to improve the efficient use of energy and to further adopt clean energy sources.

Request for Feedback:

1. *What trends are impacting your company's ability to be competitive today?*
2. *How are you managing energy today? (Energy management systems, energy efficient equipment, customer-owned generation, DR)*
3. *What is stopping your company from doing more? What is not working?*
4. *What technologies or practices that are coming could you capitalize on?*
5. *What things are happening that could stop you from better managing energy?*

Contact information

CA | Energy Efficiency Strategic Plan

Rory Cox

Regulatory Analyst, CPUC Energy Division

rory.cox@cpuc.ca.gov

415-703-1093

SOUTHERN CALIFORNIA GAS

Abdullah Ahmed

Southern California Gas Company A Sempra Energy utility®

Glad to be of service.®

EMERGING TECHNOLOGIES PROGRAM

Q4 ETCC Update

December 10, 2014

SoCalGas ETP Role

» To execute regulators' decisions
  - Number 1 loading order is energy conservation

» To bridge between RD&D and EE Incentive Programs, and extend support to statewide C&S and Local Government Partnerships

» To roll out qualified EE measures to Programs

» To perform the following activities:
  - Identify and validate affordable and new solutions
  - Collaborate and leverage with peer utilities, market entrepreneurs, and manufacturers
  - Demonstrate and educate the customer and the public
  - Foster breakthroughs and accelerate commercialization

ETP Expectations are Growing

- CPUC 2013-2014 Program Cycle:
  - Continue focus on technology assessments
  - Ensure alignment with CA Long Term EE Strategic Plan (new)
  - Plan ZNE demo/showcases, HVAC transformation projects, behavior studies (new)
  - Expand outreach with key external stakeholders (new)
- SoCalGas Management:
  - Support natural gas end-use retention activities
    - Codes and Standards (e.g., related studies, field tests concerning Title-24 standards)
    - Zero Net Energy (ZNE) engagement, demonstrations/showcases
    - NMAT/Innovation Now! participation
  - Participation and co-funding of behavior studies
    - Customer behavior projects (Nest)
    - AMI induced customer behavior studies
    - Water-energy nexus

Strategic End-Use Retention Activities

- Lead Role
  - Validation of performance of strategic, emerging technologies
  - Demonstration and showcasing of Zero Net Energy (ZNE), IDSM and behavior projects
  - Identification of knowledge gaps and technology measures in support of ZNE policy goals
- Key Contributor
  - Technology expertise for assessment and development of Residential, C&I and Food Service programs
  - Critical, technology-oriented strategic expertise on key codes and standards work (e.g., proposed Title-24 standards)
  - Active participation in NMAT/Innovation Now! team meetings

Current C&I Projects

Technology	Technology
• Cypress Wireless Steam Trap Monitoring • Rheem H_2AC Heat Recovery • PRSV (Pre-Rinse Spray Valves) Field Test • Playa Vista Commercial Near-ZNE Showcase • ENERGY STAR Fryers Scaled Field Placement • Lang On-demand Stove-top Field Testing • M2G Scaled Field Placement	• UC Davis WCEC Research of Gas Technologies: Condensing Furnaces in RTU, Gas Engine Driven Heat Pump (GDHP), Polymer Bead Laundry • Laundromat of the Future • AMI-HAN Applications in Light Commercial Segment • Wahoo AQ3 Water Recycling

Future C&I Projects

Technology	Technology
Misc. Commercial Smart HW Recirculators	Commercial Kitchen High-Efficiency Salamander
BARD Wall Mount Unit with Heat Recovery	Advanced HVAC Control
Lidded Char-Broiler	Ilios Gas Engine Heat Pump Water Heater
High-Efficiency RTU with Condensing Gas Furnace	Smart Valve Insulating Jackets
Drain Water Heater Recovery	IntelliChoice NextAire Gas Heat Pump
Lumec Boiler Controls	Destratification Fans
Smart Zonal HVAC Control	EE Cooking Technology for Commercial Foodservice
Modulating Gas Laundry Dryer	CEC PIER Award Restaurant Water Heating
Modulating Gas Laundry Dryer Retrofit Kit	CEC PIER Award Restaurant Cooking Equipment
Laundromat of the Future	Commercial Kitchen High-Efficiency Salamander
	Advanced HVAC Control

EMERGING TECHNOLOGIES COORDINATING COUNCIL

SOUTHERN CALIFORNIA EDISON

Edwin Hornquist

PACIFIC GAS & ELECTRIC

Mangesh Basarkar

ET Program Support for Industrial Programs

ETCC Q4 2014 Meeting, Downey CA
December 10, 2014

Mangesh Basarkar, Emerging Technologies
Keith Forsman, Core Products
Siva Sethuraman, Industrial & Agricultural Programs

Overview – Industrial Sector and Programs

Large and diverse customer profile in PG&E territory.. oil extraction, pipelines and refineries, minerals, chemicals, manufacturing, transportation, waste water and water treatment industries.

30,000+ Customers

Annual Electric Usage* > 10K GWH

Annual Gas Usage* > 3.5K MM Therms

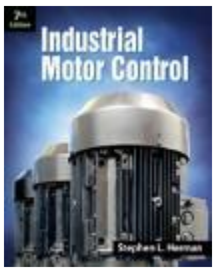
Annual Electric Savings* > 100 GWH

Annual Gas Savings* > 12 MM Therms

Top Electric Measures	Top Gas Measures
• Oil Well • Custom Industrial Processes • Linear Fluorescent • Variable Speed Drive • Compressed Air • General Purpose Motors	• Heat Recovery • Boilers and Steam Generators • HVAC Control • Pumps

** All usage and savings estimates approximate*

Program Strategy and Role of ET



Current Industrial ET Projects

- Motor opportunities – controls, early retirement etc.
- Large data centers – immersion cooling
- Lab facilities (ULT, Autoclaves etc.)
- Waste water treatment facilities (anaerobic, hyperboloid mixer)
- Pipeline drag reduction

Strategic Barriers to Overcome

- If ain't broken..
- High first costs
- Customization and niche segments
- Mission critical / short payback requirements

Further Emerging Opportunities

- Behavioral
- Intelligent controls
- Process Optimization
- Sub metering approaches

Image Source: Google

EMERGING TECHNOLOGIES COORDINATING COUNCIL

SAN DIEGO GAS & ELECTRIC

Kate Zeng

SDG&E OVERVIEW AND VISION OF INDUSTRIAL ET EFFORTS

- Align with the State's long-term energy efficiency plan and Customer Programs goals and strategies.
- Challenges & Opportunities
  - High profile, complex. Energy use often process driven. Requires specialized custom measures to achieve savings.
  - Custom, calculated programs are becoming ever more complicated and under increasing scrutiny.
    - Critical to simplify EM&V process
  - Ever increasing C&S and the need for new technologies that exceed code requirements.
- Integrated Efforts
  - DSM and incent more than energy efficiency
  - Water-Energy Nexus

SDG&E ETP'S ROLE IN MOVING THE NEEDLE

- ET efforts aimed to assist and accelerate customer adoption of innovative technologies
- ET Project Highlights & Collaboration
  - High resolution analysis of energy intensity in water systems. Partner with CWEE, IBM, SDCWA, Otay Water District
  - CEEL market assessment. Joint utility effort among PG&E, SCE and SDG&E. Partner with FNI, WCEC, My Green Lab, kW Engineering
  - Continuous commissioning M&V study with Willdan

SACRAMENTO MUNICIPAL UTILITY DISTRICT

Bruce Baccei

SMUD OVERVIEW AND VISION OF INDUSTRIAL ET EFFORTS

- Assisting Customers In Solving Problems while reducing energy intensity
- 150 Industrial/Mfg Customers
  - **Teledyne**(**80** RTU's) - Catalyst (**39**% Savings)
  - **Aerojet** – Climate Wizard, Catalyst Too?
  - **Siemens**(Locomotives) – Solar Absorption
  - **Tri Tool**- **40**% Savings

SMUD ETP'S ROLE IN MOVING THE NEEDLE

Detailed - Timely data enable more informed and mutually beneficial decisions/management:

- Sacramento County Water Agency – SMUD/SCWA collaboration on KYZ output from Smart Meter. Kilo-watt hour info will be used by SCWA for:
  - rate schedule management
  - predictive maintenance/forecasting
  - system usage uniformity
  - ADR Platform
  - More granular Substation/grid-loading info for SMUD

SMUD ETP'S ROLE IN MOVING THE NEEDLE

- Tri Tool –
  - HIDL SmartPod Highbay Lighting Fixtures
  - Luxim Plasma (parking lot)
  - LED with wireless controls (parking lot/wall packs)
  - Advanced Lighting Controls (LED Highbay + LED office)
  - Tri Tool is using lighting controls for HVAC
- Climate Wizard: Indirect Evaporative System

CALIFORNIA ENERGY COMMISSION

Virginia Lew

CALIFORNIA ENERGY COMMISSION OVERVIEW AND VISION OF INDUSTRIAL ET EFFORTS

- **Goal:** Conduct RD&D to help the industrial, agriculture and water sectors maximize energy efficiency, reduce operating costs, meet environmental challenges and increase productivity
  - *Aligned with the State's Energy Policy Goals, such as AB 32, CEC's Integrated Energy Policy Report, and CPUC's Energy Efficiency Strategic Plan*
  - *Projects awarded through competitive solicitations. Current & planned solicitations: www.energy.ca.gov/research/*

- **Strategy**: Initiatives are identified in investment plans for electric and natural gas research and once approved are developed into solicitations- may have periodic workshops/ public requests prior to solicitation release
  - *Sign up for the list serve to be notified when workshops occur and participate in the process. Sign up at: www.energy.ca.gov/listservers/ (check opportunity & research)*

- Encourage industry stakeholders to :
  - *Identify research needs through workshops/public request*
  - *Participate in solicitations, provide match funding, demonstration sites, project support*

CALIFORNIA ENERGY COMMISSION' S ROLE IN MOVING THE NEEDLE

1. Filtration system reduces aeration electricity use by 20-30% in wastewater treatment

4. Selective Tartrate Removal System (STARS) saves electricity, natural gas and water –now in 60 California wineries.

2. Solar thermal systems for small food processors reduce hot water costs by 40-80%.

3. Waterless laundry system cuts energy use by 50% and save 60 million gallons of water annually.

5. PAX fans achieved a 35-45% power reduction over existing fans.

UPCOMING ETCC EVENTS

Date	Event	Location & Host
February 18th	Q1 meeting: commercial	Los Angeles (SCE)
April 30th	Q2 meeting: cross-cutting	San Francisco (PG&E)
May 7th	Open Forum (FLoW)	Los Angeles (SDG&E)
August 11th	Q3 meeting: ag/industrial/water	Los Angeles (SoCal Gas)
November 4th	Q4 meeting: residential	Sacramento (SMUD & LADWP)
November 5th	Open Forum	Sacramento (SMUD)

To sign up for the ETCC Insight newsletter, check the box on the sign-in/registration sheet or sign up online at: www.etcc-ca.com/subscribe

Check the ETCC website for updates: http://www.etcc-ca.com/calendar

SESSION WRAP-UP

PLEASE FILL OUT EVALUATIONS!

OPTIONAL TOUR OF ENERGY RESOURCE CENTER