Making Existing Facilities Smart Industrial Internet of Things



Reduce Energy Use Detect Faults, Improve Uptime Improve Production Efficiency Enhance Safety and Compliance Minimize Maintenance Effort



Email: harry.sim@CypressEnvirosystems.com Phone: (408) 307-0922 Web: www.CypressEnvirosystems.com

Cypress Envirosystems: Problems We Solve...



Pneumatic Thermostats



Dial Gauges, Hour Meters



Steam Traps

Legacy Instrumentation:

Labor Intensive No Visibility/Fault Detection Waste Energy

Humidity & Temperature Indicators





Analog Transducers, Indicator Lights



Non-Invasive Retrofit Solutions



Wireless Pneumatic Thermostat



Wireless Gauge Reader



Wireless Steam Trap Monitor

Clamp-on Installs in Minutes SCADA Integration No Wires, No Batteries No Leak Checks



Wireless Humidity & Temperature Monitor



Wireless Transducer Reader



Wireless Gauge Reader (WGR)



- "Electronic Eyeball" reads gauges and transmits readings wirelessly
- Non-invasive, clamp-on to existing gauges in minutes
- No downtime, no leak check, no wiring, no drawings
- Battery life of 3+ years at 15 minute sample rate
- IP56/NEMA 4 rated for outdoor use
- Various size and types of mounting adapters to fit most existing gauges
- Reads dial gauges, hour meters, LED/LCD displays



Wireless Humidity and Temperature Reader (WHTM)



- $-20 \,{}^{\circ}\text{C}$ to $+70 \,{}^{\circ}\text{C}$ (-4 ${}^{\circ}\text{F}$ to 158 ${}^{\circ}\text{F}$) Temperature Range
- 0 100% Relative Humidity Range
- Magnetic Mounting for steel walls or columns
- Adhesive Mounting for other surfaces
- Battery life of 3+ years at 15 minute sample rate
- IP56/NEMA 4 rated for outdoor use



Wireless Transducer Reader (WTR)



- Enables wireless remote monitoring of virtually any analog transducer or instrument with the following outputs: 4-20mA, 0-5V, or 0-10V, RS-232, RS-485, thermocouple, thermistor
- Compatible with most existing flow meters, current meters, particle counters, thermocouples, weigh scales, etc.
- Battery life of 3+ years at 15 minute sample rate
- Optional enclosures for NEMA 6, IP 67 protection
- Enables data logging to enable trend analysis, notification, or statistical process control



Wireless Steam Trap Monitor (WSTM)





Leaking Traps Waste Energy



Typical Steam Trap

- Typical Steam Trap failure rates of 10-20% per year. Failed traps leak steam and waste energy, or become block and cause overpressure
- Manual inspection typically done annually labor intensive, do not catch problems in timely manner
- Solution: Wireless steam trap monitor detects faults and sends notifications, avoiding expensive failures
- Non-invasive installation: no breaking seals, wireless, integrates with automation system
- Battery life of 3+ years at 15 minute sample rate
- Optional IP67/NEMA 6 enclosures rated for outdoor use



Wireless Pneumatic Thermostat (WPT)

Existing Pneumatic Thermostat



Pneumatic to DDC in 20 Minutes

Wireless Pneumatic Thermostat



- Manual Setpoint Control
- No Remote Readings
- No Diagnostics
- Manual Calibration Required
- Cannot support Demand Response strategies

- Remote Wireless Setpoint Control
- Remote Monitoring of Temperature & Pressure
- Pager/Cell Notification of Excursions
- Automatic Self-calibration
- Programmable Temperature Setbacks
- Occupancy Override
- Enables Demand Response strategies
- BACnet Interface to BMS
- Compatible With Existing Johnson, Honeywell, Siemens, Robertshaw
- Battery life of 3 5 years
- Standalone operation with power failure



Wireless Communication Architecture

- LoRaWAN open protocol - US and EU frequencies available
- Secure, encrypted communications
- Star network configuration, 300-500 ft range
- Industry standard OPC-DA, OPC-UA and RESTful API interfaces



Legend

WHTM	Wireless Humidity / Temp Monitor
WTR	Wireless Transducer Reader
WGR	Wireless Gauge Reader
11	LoRA Wireless
1	Wired Ethernet

Appendix

Sample Applications



Compressed Air System Energy Savings



WGR Application - Compressed Air

Customer Challenge:

Compressed air systems are one of the largest energy users in a manufacturing facility which often run at settings beyond what is needed.

Monitoring of the compressed air system is intrusive and expensive

Installing additional compressed air capacity to accommodate system needs due to excessive leakage and compressor duty cycling.

WGR Solution:

Typically manual gauges are already installed throughout CDA systems or coolant loop systems.

WGR's can monitor and alarm pressure/flow to ensure process integrity and reduce energy use.

App note available: "Compressed Dry Air System Energy Savings"





Savings on 500hp Compressed Air System can be up to \$100K per year, with a 8 month payback.



Compressed Air – Design vs. Typical Case



Typical Plant Operator Overpressures to Compensate for Potential Losses



Paint Shop Quality and Maintenance Savings



Paint Shop Filter Monitoring

- Retrofit existing pressure gauges for
- remote monitoring, trending and alarming.
- Ensure positive pressure in paint areas
- Replace air filters at optimal intervals
- Reduce consumables cost, maintenance labor, and fan energy cost





Analog Magnehelic Gauge



Wireless Magnehelic Reader





Bag Houses Compliance and Safety Improvement



Application – Bag House and Filtration

- Approximately 5 million baghouses installed worldwide remove pollutants and particulates from the exhaust air of industrial facilities
- Avoiding baghouse failure is critical to ensure safety and regulatory compliance
- Improperly maintained baghouses can have catastrophic fires and explosions
 - 130 deaths and 800 injuries since 1980
- Regulatory agencies oversee baghouses to ensure air quality
 - Over 500 administrative penalty cases
 - 100 judicial enforcement cases
 - Penalties often exceed \$1 million per incident
- Industries that use baghouses:
 - Stone & Cement, Steel, Power, Mining, Chemical, Waste, Food, Pharmaceutical









Pulse Jet



Legacy Baghouses



Typical Baghouse



Baghouses Require Frequent Maintenance and Inspection

- Existing analog systems make maintaining baghouses challenging
- Regulatory audits can be cumbersome due to lack of historical data
- Failures can persist for weeks or months without notice, increasing potential fines and safety risks
- Manual inspection of analog systems is labor intensive
- Production line efficiency can be impacted
- Energy is wasted



Retrofit Magnehelic Gauges and Flow Meters



Analog Magnehelic Gauge



Wireless Magnehelic Reader



Airflow Meter



Wireless Transducer Reader

- The Wireless Magnehelic Reader (WMR) is a version of our Wireless Gauge Reader (WGR) for Magnehelic gauges
- The WMR combined with the Wireless Transducer Reader (WTR) access the data in existing Magnehelic gauges and flow meters
- The WMR and WTR provide data for central monitoring and alarming of baghouses
- Trend data helps maintenance teams identify issues before failures occur
- Alarms can be set to avoid catastrophic failure
- Historical data can be used to verify compliance making audits faster and easier
- Integration with existing systems can close control loops for more efficient operations



Baghouse Monitoring Solution Benefits



Baghouse Monitoring Solution Provides Data and Alarms to Avoid Failures

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egacy gauges at	↓ Iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii	Ci Δi	DATA	nd		
flow meters or baghouses	1		MAINTENANCE			Dashboard and email/text alarm
Δp Reading	Alarm	Possible Fau	lts	Potent	ial Issues	
7 in. H ₂ O		• None		• None		
9 in. H ₂ O		 Pulse jet cleaning Broken diaphrag Defective electri Clogged filter bags 	system malfunction gm ical components	 Increase Shortene Wasted Producti 	d fire/explosion hazard ed filter bag lifespan compressed air usage on downtime	
2 in. H ₂ O		 Leaks in filter bags Filter bags worn of End of lifecycle Material defect 	5 ut	EPA non Detrime Wasted	-compliance of Clean Air Act ntal to filter bag lifespan compressed air usage	

Gas Cylinders Labor and Consumable Savings



Wireless Gauge Reader (WGR) vs. Conventional Solution

Conventional Pressure Transducer Solution



- Requires skilled technician to install incurs cost of team, truck rolls
- Requires cylinder/process to be taken offline
- Risk of introducing leaks
- Risk of damaging regulators

Non-Invasive, Optical Wireless Gauge Reader Solution





- Easy installation, faster deployment
- No breaking seals, no leak checks
- No disruption to customer's operation
- Long battery life up to 5 years

WGR Provides Faster Time to Market, Lower Cost and Risk to Deploy, Sustainable Differentiation

Received Top Industry Recognition and Award

Cover Story





GOLDEN GAS AWARD 2010

Gases & Instrumentation International Announces the Winners of the 2010 Golden Gas Awards

Wellesley Hills, MA—February 17, 2010—*Gases & Instrumentation International*, a MetaWord, Inc. premiere publication covering the technology of industrial, specialty and medical gases, announces the winners of the 2010 Golden Gas Awards.

This year's competition attracted more than 43 entries in 8 categories. Each product was rated on 5 criteria based on the product's ability to solve an important challenge to the gas industry; technological innovativeness; environmental "green" attributes; superior specifications in terms of power requirements, speed, footprint, maintenance; cost effectiveness, and other quality considerations. Each criterion was awarded points from 0-10. If any product came within 3% of the winner, it was given the Silver Award.

Paul Nesdore, G&I's Publisher/Editor stated that, "This is the finest array of products we have ever seen. Our judges, representing decades of experience in all aspects of gases technologies, had a difficult time, as the products entered represented the cutting-edge of gases technology and implementation."

Proven Technology Deployed Since 2008

ENVIROSYSTEMS'

Current Versions of WGR Already Deployed

CATERPILLAR®



- Peoria, IL ~200 Cylinders
- Initial installation in 2011
- Large site, basement areas
- Demanding, data driven end-customer





walls

Data Acquisition Beyond Pressure Gauges

Wireless Barcode Reader





Reads Barcodes for EPA Gases

Wireless Transducer Reader





Reads 4-20mA, 0-5V, 0-10V, thermistors, thermocouples, RS-485:

- Weigh Scales
- Flow Meters
- Temperature Sensors



Flexible System Can Also Read Barcodes, Weigh Scales, Flow meters

Vibration Monitoring Condition Based Monitoring & Fault Diagnostics



Wirelessly Capture Data from Vibration Sensors



Monitor Vibration Changes Over a Period of Time (e.g. misalignment, not for high frequency analysis)



Pumps/Compressors Condition Based Monitoring & Fault Diagnostics



Pump Head Pressure vs. Flow Rate – Failure Diagnostics

Customer Challenge:

Detect pending failure for pumps and compressors, and proactively repair or replace before production is impacted.

WGR Solution:

Use WGR and/or WTR to non-invasively monitor pump head pressure and flow rate, current consumption and compare with manufacturer's spec.

Early detection of faults when performance deviates from spec.



WGR installation takes minutes and cost 70% less than transmitters... and may be removed and reused at other locations



HEPA Filters Energy and Consumables Savings



Monitoring of Legacy Air Handlers



Typical Air Handler Units



Wireless Magnehelic Reader Monitors Filters and Airflow

- Most older Air Handler Units (AHU's) are not monitored/automated
- Labor intensive to detect problems, check filters
- Proper air flow is the critical parameter but can only be seen via manual dial gauges (e.g. Magnehelics)
- Solution: Wireless Magnehelic Reader clamps on in minutes and transmits reading wirelessly to BMS/BAS
- No downtime, no wiring, no leak checks
- Alarm notification for filter changeout, low air flow
- Condition-based maintenance, not schedule-based



Wireless Readers Mounts Over Existing Gauges

Enables Monitoring of Legacy Air Handlers for 70% Less Than Traditional Transducers



Duct/VAV Box Measurements





Equipment Monitoring Condition Based Monitoring & Fault Diagnostics



Improve Asset Health and Uptime

Customer Challenge:

Older equipment such as packaged heat exchangers, boilers, chillers, air dryers, hydraulic conveyors, water filters, HEPA filters, etc. often have little or no electronic monitoring outputs.

Adding new transducers require modifying the equipment package and may impact existing service/ warranty agreements.

WGR Solution:

Typically manual gauges are already installed on older packaged equipment.

The WGR can monitor, trend and alarm parameters for early fault detection and corrective action.

Case Studies Available: *"Facilities Monitoring"*

"Tri-State Power Asset Health Monitoring"



"In the first two weeks of using the WGR, we were able to detect and develop corrective measures for a potentially costly issue that we never suspected" – Mike Long, Control System Supervisor, Tri-State Generation and Transmission



What is our Solution?





WIRELESS GAUGE READER

"Go from Pneumatic to DDC in minutes"

NETWORK CONTROLLER



WIRELESS TRANSDUCER READER "Remotely Read Transducers – No Wires"



WIRELESS FREEZER MONITOR "Predicts and Avoids Costly Freezer Failure"

Non-invasive, easy retrofit, energy and labor savings, payback under one year



WIRELESS STEAM TRAP MONITOR

"Avoid Expensive Steam Leaks"

Steam Trap Monitoring Condition Based Monitoring & Fault Diagnostics



Wireless Steam Trap Monitor (WSTM)





Leaking Traps Waste Energy



Typical Steam Trap

CYPRESS ENVIROSYSTEMS WIRELESS STEAM TRAP MONITOR

- Traps are a necessary part of the steam distribution system, usually hundreds of units per site
- 15-20% average failure rate; leaks steam
- Failed traps lose \$5,000 per year (1/8" orifice)
- Manual inspection typically done annually labor intensive, do not catch problems in timely manner
- Solution: Wireless steam trap monitor detects faults and alarms on error, avoiding expensive leak loss
- Non-invasive installation: no breaking seals, wireless, integrates with BMS
- Battery life of 3+ years at typical sample rates
- IP65/NEMA 4 rated for outdoor use
- One year payback on investment



Save Energy and Time Locating Faulty Steam Traps

WSTM Payback Matrix

WSTM Payback Calculator² (years)

WSTM Installed Cost ³ :		Steam	Trap O	rifice D	iame	ter											
\$850 per unit		1/32"	1/16"	3/32"	1/8"	5/32"	3/16"	7/32"	1/4"	9/32"	5/16"	11/32"	3/8"	13/32"	7/16"	15/32"	1/2"
Your Steam Cost:	5	76.4	28.9 23.8	14.2 11.5	8.3	5.4 4.4	3.8 3.1	2.8	2.2	1.7 14	1.4	1.2	1.0	0.9	0.8	0.7	0.6
\$20 per 1,000 lbs.	15	59.7	20.3	9.7	5.6	3.7	2.6	1.9	1.5	1.2	1.0	0.8	0.7	0.6	0.5	0.5	0.4
Inspection Frequency ⁴	25 50	49.0 33.9	15.7 10.0	7.4 4.6	4.2 2.6	2.8	1.9 1.2	1.4 0.9	1.1 0.7	0.9	0.7	0.6 0.4	0.5	0.5 0.3	0.4	0.4 0.2	0.3
1 times (vear	75	25.9	7.3	3.4	1.9	1.3	0.9	0.7	0.5	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.2
(intes/year	125	17.6	4.8	2.2	1.5	0.8	0.7	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1
Inspection Costs ⁵ :	150 175	15.2 13.3	4.1 3.6	1.9 1.6	1.1	0.7	0.5 0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.1 0.1	0.1	0.1	0.1
\$5 per trap	200	11.9	3.2	1.5	0.8	0.6	0,4	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Facility Uptime:	225 250	9.8	2.9	1.3	0.8	0.5	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
365 days/year	275 300	9.0 8.3	2.4 2.2	1.1 1.0	0.6	0.4 0.4	0.3	0.2	0.2	0.2	0.1	0.1 0.1	0.1	0.1 0.1	0.1	0.1	0.1
Failure Rate ⁶ : 15% per year	I	Paybac	k Perio	bd	0 - 2	Years				2 -	8 Year	s			8+	Years	

1. Orifice diameter should not be confused with pipe diameter. Consult the steam trap manufacturer if orifice size is not known.

2. Calculations are theoretical estimates and actual results will vary. Payback calculation includes avoided lost steam and inspection labor. Benefits from avoided damage resulting from blocked traps are not included in model. The formula used for steam loss in this model is: L=24.24*Pa*D2. Where L=pounds/hour, Pa=Pgauge + Patm , D=orifice diameter. http://www.energy.rochester.edu/efficiency/steam.pdf

3. Actual WSTM installed cost will vary based on volume and integrator.

4. Refers to the manual inspections of steam traps that are currently being done at the facility. The frequency determines the potential avoided failure time when using the WSTM.

5. The frequency and cost of inspection determine the labor savings enabled by the WSTM.

6. The failure rate per year should be based on historical data from the facility, 15-20% failure rates per year are typical. In unmaintained facilities, the failure rate can be much higher: http://www1.eere.energy.gov/femp/pdfs/om_combustion.pdf



WSTM Distribution System Applications

Thermocouples Allow Remote Mounting of Transmitter



Standard NEMA 4 Enclosure



25 foot deep *cement bunkers*



"Hard to Access" Remote Monitoring = \$\$\$ Savings & Eliminates Safety Incidents

WSTM Executive Summary Report



WSTM Executive Summary Report

Overview

Total Number of T	raps: 12	S	Energy Sun	nmary
Health Status	Count	% of Total	Steam loss (lbs/hr)) 35.2
Nodes with low battery	0	0.00	Dollar loss (\$/yr)	4,691
Nodes with poor RF signal strength	0	0.00		





Condition	Count	% of Total
Good	8	66.67
Out of Service	3	25.00
Blowing	1	8.33
Error	0	0.00
Flooded	0	0.00
Leaking	0	0.00

35.70 4,691.38





Comprehensive Reports with Energy Summary for Analysis and Auditing of All Traps

Customer Example





BBS

WRE

WSTM

CYPRESS

RND Pharma Saves Energy Using Wireless Steam Trap Monitors

Wireless devices automate steam trap fault detection, avoid exposing workers to hazardous areas, and pay back in less than one year

The Challenge

- RND Pharma's Technology Center Headquarters site uses over 2,400 steam traps in their campus wide steam distribution system.
- Undetected leaks from steam traps waste significant energy throughout the system.
- Frequent monitoring is required to detect leaks in a timely manner.
- Manual audit of traps are problematic because many are inaccessible or in potentially hazardous locations i.e. subterranean location, at temperatures up to 500° F.
- The situation created a dilemma between meeting RND's energy saving goals, and maximizing safety for personnel.

The Solution

- RND Pharma selected Cypress Envirosystems' cost-effective turnkey solution for Wireless Steam Trap Monitoring that can automate monitoring in difficult locations.
- The installation was non-invasive no need to shut off steam lines, and no disruption to production operations in any way.
- Pilot project for 12 Wireless Steam Trap Monitors (WSTM) cost less than \$10,000.

The Results

- Automating steam trap monitoring has significantly reduced the time to detect a steam trap failure, saving thousands of dollars for each leaking trap. The system also reduced the labor and potential safety hazards associated with manual audits.
- Expected payback period for the system is about 12 months.
- "The Wireless Steam Trap Monitor installation has provided us with a solution that cost-effectively addresses our need to save energy and increase safety and reliability across our entire complex," said John Smith, Manager of Utility Steam Plant Operations, RND Pharma Technology Center Headquarters.

http://www.cypressenvirosystems.com/files/pdf/RND%20Pharma
%20Saves%20Energy%20Using%20Wireless%20Steam%20Trap%20Moni
tors.pdf



What is our Solution?





WIRELESS FREEZER MONITOR "Predicts and Avoids Costly Freezer Failure"

Non-invasive, easy retrofit, energy and labor savings, payback under one year



Zone Control with Wireless Pneumatic Thermostat (WPT)

EXISTING LEGACY STAT

DDC in 20 Minutes!

- Manual Setpoint Control
- No Remote Readings
- No Diagnostics
- Manual Calibration Required
- Cannot support Demand **Response strategies**

CYPRESS ENVIROSYSTEMS WIRELESS PNEUMATIC THERMOSTAT



Building Operating Management 2012 Top Product

- Remote Wireless Setpoint Control
- Remote Monitoring of Temperature & Pressure
- Pager/Cell Notification of Excursions
- Automatic Self-calibration
- Programmable Temperature Setbacks
- Occupancy Override
- Enables Demand Response strategies
- BACnet Interface to BMS
- Compatible With Existing Johnson, Honeywell, Siemens, Robertshaw
- Battery life of 3 5 years
- Standalone operation with power failure



WPT Installation

- Opening walls and running wire drive up traditional DDC retrofit costs
- Occupants do not want to be disrupted by projects
- The WPT provides benefits of DDC zone control
 - ✓ 20-minute retrofit
 - ✓ 80% lower cost

ROSYSTEMS

✓ Minimal disruption

Traditional DDC Retrofits are Invasive



The Wireless Pneumatic Thermostat Provides (WPT) DDC Zone Control without Disruption

Step 1	Step 2	Step 3	Step 4	Step 5
Identify pneumatic thermostat type	Remove thermostat and backplate	Install WPT backplate to wall	Attach pneumatic pipes to WPT	Hang on wall and integrate with BAS

Post Installation Benefits

- Increased Energy Efficiency
- Improved Tenant Satisfaction
- Reduced Maintenance Effort
- Enable Demand Response Load Mgm't
- Gain LEED Points



Wireless Pneumatic Thermostat Savings



Same Benefits as Direct Digital Control – but at a Fraction of the Price and Disruption



Oakland Shines: Quantified case studies from three commercial buildings in Oakland, California



Building Profiles Savings \$0.20/sq-ft savings/yr ✓ 249,271 kWh/year ✓ 10,045 therms/year CIM Properties ✓ 139 kW 1333 Broadway • 287 thermostats ✓ Simple Payback: 5 months • 238,000 square feet \$0.19/sq-ft ✓ 419,445 kWh/year savings/yr Beauty in the heart of Oakland ✓ 3,835 therms/year The Oakland Rotunda ✓ 98 kW • 300 Frank Ogawa Plaza ✓ Simple Payback: 1.4 years • 261 thermostats • 352,000 square feet METROVATION ✓ 175,063 kWh/year One of a kind, always the best ✓ 2,686 therms/year Metrovation \$0.16/sq-ft ✓ 133 kW • 2201 Broadway savings/yr

- 290 thermostats
- 192,893 square feet

utility costs."



✓ Simple Payback: 2.8 years

"The wireless thermostat project has given 1333 Broadway the ability to look several layers deep into the performance of the building and make adjustments for tenant comfort, all the while greatly lowering



-Bob Woltz, Chief Engineer

UC San Diego – California Energy Commission Data

McGill-Mandler Hall Building Electric Demand Before and after WPT installation



Source: Energy Solutions Inc. under contract to California Energy Commission



PROJECT DATA

PROJECT SUMMARY Site: McGill-Mandler Hall Location: UC San Diego Project area 112,500 square for Built: 1970 SAVINGS: 27% Electrical 51% Gas 0.2 yrs Payback

ENERGY INFORMATION

Annual electricity use before retrofit: 2,561,477 kWh Annual natural gas use before retrofit: 111,983 therms Annual electricity savings: 538,901 kWh Annual natural gas savings: 56,944 therms

PROJECT ECONOMICS

Annual utility cost savings: \$94,931 Total project cost: \$295,655 Utility & CEC incentives:

- SDG&E UC Partnership Program Rebate \$186,280
- Energy Technology Assistance Program Rebate \$94,749 Simple payback: 0.2 years

EQUIPMENT INSTALLED

- 250 Cypress Envirosystems Deadband Wireless
 Pneumatic Thermostats
- 3 Cypress Envirosystems Green Box Controllers
- 25 Cypress Envirosystems "Wall Powered" or " 24VAC Powered" Repeaters

The WPT's diagnostic data enable retro and ongoing commissioning to improve maintenance costs and save energy





Wireless Pneumatic Thermostat Savings



but at a Fraction of the Price and Disruption



Reduced Hot/Cold Calls – 345 California St, San Francisco

- 17,000 sq-ft Class A Office Space, 31st Floor
- 48 Story Hi-Rise, managed by Cushman & Wakefield
- San Francisco Financial District
- Tenant: Private Equity Firm

Pre-WPT Installation Mar – Nov, 2009

OSYSTEMS

W.O #	DATE	TENANT	FLOOR	OFFICE#	REQUEST	TEMP.	WORK PERFORMED	BY	#
148516	9-Mar-09		31	3115	COLD		FOUND STAT PUTTING OUT 1#	JIM	1
150125	6-Apr-09		31	LARGE CONF.	PRE COOL		PUT STAT INTO COOLING FOR MTNG.	TIM	2
150195	8-Apr-09		31	CONF ROOM	COLD		CAL. T-STAT AND SET TO 70-74	PAUL	3
150500	15-Apr-09		31	3146	COLD	70	OFFICE TEMP. WAS 70	PAUL	4
151016	27-Apr-09		31	3155	COLD	71	TEMP. WAS 71	FRAZER	5
153307	15-Jun-09		31	CONF ROOM	HOT	73	AMBIENT 73 LOWERED STAT TO 65/70	PAUL	6
153976	26-Jun-09		31	EAST CORNER	COLD	73	RM TEMP 73 RAISED STAT TO 74	JIM	7
153991	26-Jun-09		31	PINE SIDE	COLD	73	AREA TEMP. 73, RAISED STAT TO 74	JIM	8
N/A	6-Jul-09		31	3156	COLD	71	OFFICE TEMP. WAS 71	PAUL	9
154347	7-Jul-09		31	S. ADMIN	COLD	72	AREA TEMP WAS 72	C.W/ PF	10
155020	22-Jul-09		31	3115	COLD	71	AREA TEMP AT 71 F, TSTAT AT 75 F	ART	11
155582	5-Aug-09		31	3134-A	COLD	73	AREA TEMP WAS 73.	CRAIG	12
155597	5-Aug-09		31	N CONF RM.	COLD		T'STAT SET TO 65-69, RESET TO 70-73	ARTURO	13
155597	5-Aug-09		31	NORTH CONF RM	COLD	68	TEMP. WAS 68 RESET TO70-73	ART	14
155808	12-Aug-09		31	3104	HOT		RE-SET STAT TO 71-74, FROM 70-74	CRAIG	15
157113	8-Sep-09		31	3127	HOT		CAL. STAT AND SET TO 71-74	CRAIG	16
157849	30-Sep-09		31	CAL. ST. SIDE	COLD		CAL. AND SET STAT TO 75	CRAIG	17
158278	6-Oct-09		31	3134A	COLD		REDUCED CFM, REDIRECTED AIR FLOW	C.W./S.T.	18
158192	7-Oct-09		31	3134A	COLD	74	TEMP.IS 74 ADJUSTED TWO STATS IN AREA	ART	19
158563	16-Oct-09		31	EAST CORNER	HOT	73	SET STAT TO 73	GRAIG	20
159030	27-Oct-09		31	3152	HOT	71	OFFICE TEMP. WAS 71	PAUL	21
159095	29-Oct-09		31	EAST CORNER	COLD	72.5	AREA TEMP WAS 72.5	ARTURO	22
159113	29-Oct-09		31	3146	HOT		DECREASED STPT TO 71-74 FROM 71-75	ARTURO	23
159222	2-Nov-09		31	3146A	HOT		CHILLER STARTED AT 10:45	ARTURO	24
159222	2-Nov-09		31	3146A	WARM	73	AREA TEMP WAS 73. MADE NO ADJ.	ARTURO	25
159240	2-Nov-09		31	WEST A DMIN	WARM	71.5	AREA TEMP. WAS 71.5 MADE NO ADJ.	PAUL	26
159321	3-Nov-09		31	3143/3140	WARM	72.5	AREA TEMP. WAS 72.5 MADE NO ADJ.	PAUL	27
159759	13-Nov-09		31	N CONF RM.	COLD	69	INCREASED SPT TO 71-74, FROM 69-73	ARTURO	28
159854	17-Nov-09		31	N CONF RM.	COLD	69	CAL. AND SET STAT TO 71-74	CRAIG	29

Post-WPT Installation Mar – Nov, 2010

W.O #	DATE	TENANT	FLOOR	OFFICE#	REQUEST	TEMP.	WORK PERFORMED	BY	#
164055	1-Mar-10		31	3155	COLD	69	NEW W.P.T. WAS SET AT 71, SET TO 74	PAUL	1
164473	5-Mar-10		31	3113	COLD	71	FOUND COAT HANGING OVER T-STAT	PHIL	2
164916	12-Mar-10		31	3134A	COLD	72	SUPPLY AIR AT 68F STAT SET @ 72, RAISED TO 73	ART	3
165486	25-Mar-10		31	3120A & B	COLD	72	RAISED SPT. TO 73	CRAIG	4
166825	27-Apr-10		31	3120A & B	COLD	72	WPT WAS SET TO 73, RAISED TO 74	PAUL	5
166853	27-Apr-10		31	3121	HOT	77	UNABLE TO CALIBRATE WPT WILL FOLLOW-UP	PHIL	6
166994	3-May-10		31	3121	HOT	76	FOLLOW-UP TO REPLACEMENT OF WPT BY	CRAIG	7
169919	28-Jun-10		31	3155	COLD	70	RESET STAT TO 72	CRAIG	8
174033	27-Sep-10		31	PINE SIDE	HOT	80	CALIBRATED (3X) STATS AND SET AT 70 F.	CRAIG	9
176108	17-Nov-10		31	3155	COLD	70	STAT WAS SET @ 71 RAISED TO 73	PAUL	10

✓ 66% reduction in hot/cold calls ✓ 25 avoided calls/year ✓ 7-10¢/sq-ft/year savings







LEED Credits



LEED for Existing Buildings: Operations & Maintenance Registered Project Checklist

			Energy & A	tmosphere, continued		
			Existing Build	ing Commissioning		
•	•	•	Credit 2.1	Investigation and Analysis	✓	2
•			Credit 2.2	Implementation	\checkmark	2
•	•	•	Credit 2.3	Ongoing Commissioning	\checkmark	2
			Performance I	Measurement		
•	•		Credit 3.1	Building Automation System	✓	1
•			Credit 3.2-3.3	System Level Metering		1 to 2
	•		-	Credit 3.2 40% Metered		1
				Credit 3.3 80% Metered		2

Tenant Comfort and Satisfaction, Ability to Attract Top Tier Tenants, and Lower Lease Churn Rates Are Incremental to Energy Savings Benefits



Built-in Web Interfaces and Cloud Connectivity

	CYPRESS ENVIROSYSTEMS							_		-		Demo U	Iser(demo) Locout
an a salar	Zone Monitor Setup	DashBoar	User /	Adm	nistration	Alarm	twork St	Sch	edule	,	Advanc	ed	Help
Sec. 1 1218 (0)	-ALL Zanks	Beñas	h A	cknc	wiedge								
	2001 - (2001) - 2002 (2002) 2003 - (2003)	NodelD	Alarm ⁴	ACK	Node Name	Setpoint (2E)	Cool Above I'E)	Heat 1 Below 1 ("E1	Zone Temp (°E)	Branch Pressure (PSI)	Battery Level	Occupancy State	Time
	- 2004 - (2004) - 2005 - (2005)	2001	*		2001	72		-	0.48	7.63	ок	Oventde Off	11/3/2010 10:19:02 /
and the second statement of th	2006 - (2006) - 2007 - (2007)	2002	*	D	2002	75			643	14.74	ок	Dvenide Off	11/3/2010 10:20 02 A
理趣定于自主	2000 - (2000)	2003	1		2003	71		1	0.03	9.47	ак	Overnde D#	11/3/2010 10:19:04 4
CALIFORNIA PRODUCT ADDRESS	2004 - (2004)	2004	* 1		2004	/4		6	39.35	16.50	сĸ	Override	11/4/2010 10:19 22 2
	2000 - (2008)	2015	*		2005	72			9.35	9.74	ок	Ovenide	11/3/2010 10:19 06 /
	2041 + (2041) - 2042 - (2042)	2006			2005	71		-	70.25	8.95	ок	Ovenide	11/3/2010 10:19:07 A
	2040 - (2040) - 2044 (2044)	2017	w		2007	71		6	59 80	7.85	OK.	Oventide	11/3/2010 10:19:08 4
	2045 - (2045) - 2046 - (2045)	2018	-	-	2008	61			70.70	0.05	CK.	Off	11/3/2010 10:19 09 4
A DESCRIPTION OF THE OWNER OWNER OF THE OWNER OWNER OF THE OWNER	2051 - (2051)	2000	-		SHOW	24				10.29	1112	Off Override	21/2/2010 00 19 00 1
	- 2061 - (2051)	2038	20		5004	71			20.02	9.65	OF.	Orr Overrida	112/2010 10 10 11
	2062 - (2062) - 2069 (2063)	2004		-	2004				0.00	0.00	OK OK	Oli Oventida	100/2010 10.15(117
	2004 - (2004) - 2065 - (2065)	2008	T		2000	73		e.	59.13	12.89	UK	Off	11/3/2010 10:20:12 /
	- 2081 - (2081) - 2082 - (2082)	2041	M)		2041	71			(0.70	6.98	OK	Off	11/3/2010 10:20 02 4
	- 2083 (2083)	2042	4		2042	71			70.03	7 85	ак	Off	11/3/2010 10:20:19 4
	- 2012 (2092)	2043	ę.		2043	71			0.48	8.95	uк	Diff	11/3/2010 10:20 64 4
	2053 - (2093) - 2101 - (2101)	2044	87		2044	71		6	9.10	0.68	0K	Override Dif	11/0/2010 10:21:21 /
	- 3001 - (3001)	2045	4		2045	71		1	70.25	5.00	ок	Oventida Off	11/3/2010 10:21:06 /

Direct Integration into BMS Headend via BACnet/IP

Cypress Envirosystems GBC Interface

Dens Minaker Dens Greups	betas	(Parts)		Ada arga 1 Ach a	hargan	[Rises Agents]#	abaard Dathin	******			**	(Net
- 2062 - 129015		-	8/are		Note	Response CES	Annte Balte	Stern Terms CTL	Brankh Continent	Sattern Lanet	Occupanty Blate	- 200
- 2008 - 120041		2967	τ.	0	2011	72		20.48	745	OK .	Overste	11/9/2010 18:18:02 AM
- 2004 - (1000)		3983	*		2012	75		86.43	14:14	CH.	Dyernali Cer	1102210 18 26 62 AM
- 2008 - 120001		2903			2829	74		20.00	9.40	00.	Eventer DR	11/3/2010 18 18 04 AB
- 2554 - (2854)		284			2014	24		40.1D	16-58	(Dail	Ovenide	11/10/2010 18 18 22 AM
- 2004 - 120041		2908		0	2809	72		109.00	8.74	DK .	Oversite	150/2010 10 10 06 48
- 5045 - 12042)		3968			28.8	71		31.25	6.15	DK.	Overste -	11002510 18 19 87 AM
- 1244 - 122441		2007			Dept	24		44 m	1.89	OK.	Overnite	11022010 18 19 00 76
- 2040 - 120401 - 2044 - 120401		2008			28.8	-		20.75	0.00	-	Overtable Corr	11/3/2010 18 18 09 44
- 2091 - (1991) - 2082 - (1993)		2004	τ.	0	20.0	71		10.13	10.78	DC.	Overnae Cir	11022010 10 19 10 44
- 2062 - (2062)		2014			208	171		79.02	4.00	OK:	Chandle Of	1100001010101011
- 2968 - 12961		2008	+		2018	79		69.12	12.09	04	Overtube	11/0/2010 18 28 12 AM
- 2061 - 12061		2941			2841	75		70.75	4.98		Civernale Cir	1102010-18.20-02-40
- 2002 - (10021		1943			2942	21		20.00	2.00	00	Oversite Of	11/3/2010 18:28 19 AM
- 2041 - 129411		2945			2948	m		20.48	4.16	DC:	Overner Cirr	11002010 10:00 04:44
- 2000 - (1900)		2944			2944	11		89.13	0.68	04	Overnae	11002010 10:21 21 Au
- 20024 - 1200221		2945			264	191		30.25	100	06	Dvernier Car	11/0/2010 12/21 06 AM

WPTs in Honeywell's EBI





WPTs in Schneider's StruxureWare



WPTs in JCI's Metasys



Sample WPT Commercial Installations

















