

# *Beyond SCADA*

*Advanced Solutions to solve Water  
& Wastewater Industry issues*

**Jürgen “Rudy” Engert**

**Vertical Business Manager**

North America

Smart City

Water & Wastewater

Energy Management





## *The mission of the Water and Wastewater Industry:*

to provide a reliable service  
at affordable rates  
that delivers high quality water<sup>1</sup>  
in a sustainable<sup>2</sup> environment

RELIABILITY

COST EFFICIENCY

COMPLIANCE

SUSTAINABILITY



# The risks to this mission...

- RELIABLE SERVICE

- Service interruptions can be costly
- Overflows can have permit and liability implications
- Security breaches can cause interruptions

- AFFORDABLE RATES

- Unaffordability can cause:
- Social cost repercussion
  - Public Relations issues

- HIGH-QUALITY  
(COMPLIANCE)

- Poor quality can cause:
- Health issues
  - Environmental issues
  - Permit issues
  - Fines
  - Liability

- SUSTAINABILITY

- Damage to ecosystem
- Permit issues
- Fines
- Liability

ANYTHING THAT GETS IN THE WAY OF  
ACHIEVING THESE GOALS IS A RISK, AN  
ISSUE.

# ***ISSUES IN THE INDUSTRY***



# #1 The Economy / Business Factors



- Water is an essential resource to life
- Water rates rarely reflect actual costs
- Cannot cut corners to cut costs
- Repair and Replacement lags current needs
- Economy driven
- Financing infrastructure replacement
- Increase rates to sustain operations
- Reduced revenues
  - Demand for water declining
  - Sluggish construction of NEW homes
  - Customers behind on payments

*“Reduced revenues from the economic slowdown will delay needed capital investment and potentially reduce service levels.”*

— Region 1 Consultant

# #2 Infrastructure



- Infrastructure is the overarching concern, deemed failing.
- Economy and Regulatory topped because fear of lack of funding for infrastructure.
- Every year ~ 250k water main breaks. 75k SSO's dumping ~ 3 to 10 billion gallons of untreated water
- Expected \$500 billion gap in funding by 2020
  - Where will the money come from?
    - Raise fees to fund your own replacements
    - Cross connections: Who will pay?
    - Water Leaks in the system: Who pays?



# #3 Regulatory



## New and increasingly stringent water regulations

- Financing infrastructure replacement to meet regulatory demands
- What regulations have an ROI? At what point do we accept risks over paying to meet tough regulations?
- Replace infrastructure or meet regulatory demands: Where would you put your money?

**EPA** United States Environmental Protection Agency

LEARN THE ISSUES SCIENCE & TECHNOLOGY LAWS & REGULATIONS ABOUT EPA

Advanced Search SEARCH

Contact Us Share

### Water

EPA enforces federal clean water and safe drinking water laws, provides support for municipal wastewater treatment plants, and takes part in pollution prevention efforts aimed at protecting watersheds and sources of drinking water.

**Topics:**

- Animal Feeding Operations
- Biosolids
- Drinking Water
- Ground Water
- Hydraulic Fracturing
- Impaired Waters
- Mercury
- Mountaintop Mining
- Oceans and Coastal Waters
- Surface Water: Lakes, Rivers, and Streams
- Stormwater
- Wastewater
- Watersheds
- Wetlands

**Major Environmental Laws**

- Clean Water Act (CWA)
- Marine Protection Research and Sanctuaries Act (MPRSA)
- Safe Drinking Water Act (SDWA)
- Shore Protection Act (SPA)

**General Information**

- CWA Compliance Assistance
- CWA Compliance Monitoring
- Water Enforcement
- Water: Laws & Regulation
- Water: Regulatory Information
- Water: Policy & Guidance

**Animal Feeding Operations**

See: Cross-Cutting Issues: Animal Feeding Operations

**Biosolids**

Biosolids are the nutrient-rich organic materials resulting from the treatment of sewage sludge. Only biosolids that meet the most stringent standards spelled out in federal and state rules can be approved for use as a fertilizer.

Read more at Biosolids. Includes guidance, publications, and answers to frequent questions.

- Compliance

Biosolids Compliance Monitoring: Information about inspections, evaluations and investigations.

**Drinking Water**

The Safe Drinking Water Act (SDWA) is the main federal law that ensures the quality of Americans' drinking water. Under SDWA, EPA sets standards for drinking water quality and oversees the states, localities, and water suppliers who implement those standards.

Read more at Regulatory Information: The Safe Drinking Water Act

**Laws and Regulations**

- Current Drinking Water Regulations: Provides information on regulations on contaminants EPA regulates in

**Frequent Questions**

- Do water filtration devices need to be registered?
- Where can I find information on water quality criteria or standards?
- Who do I contact to report a wastewater issue in my community?

Ask a Question

**Related Sectors**

- Agriculture
- Chemical Manufacturing
- Construction
- Healthcare

**International/Tribal**

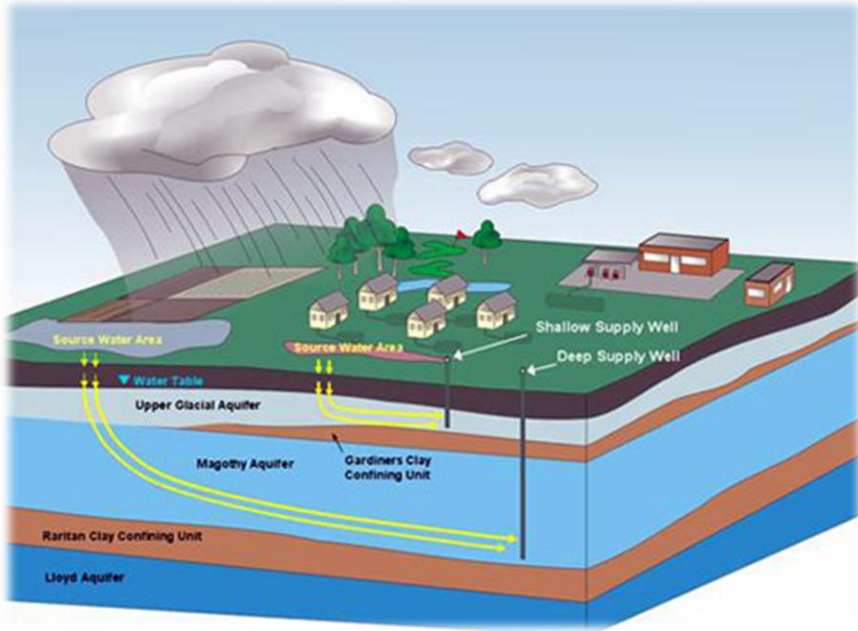
- Ground Water and Drinking Water Tribal Programs
- International Priorities: Clean Water

**EPA Envirofacts**

What companies have been issued permits to discharge waste water into rivers in my area of interest as reported by the Permit Compliance System?

Enter any geographic location

# #4 Source Water



- Ensure adequate supplies of safe water
- Regions 4 & 5 most concerned (Western United States)
  - Increased demand
  - Drought
- What about conservation – use less!
- Dual Distribution Network?
  - Only Drinking Water is treated to drinking water standards?
- Industrial use and treatment...

*“The issue will be who will be cut back on the supply of water: farmers, cities or fish.”*

— Region 5 Public Affairs Manager



# #5 Workforce



## Aging Workforce: The Brain Drain

“The Jack of All Trades guy is getting older and is being replaced by the Game Boy Generation, which means they know computers but do not comprehend how such things as pumps and piping work.”

— Utility Manager

## Your Workforce in 2020

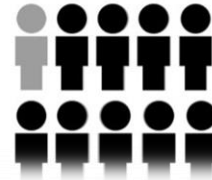
- More than one in three employees will be over 55



- One in five employees will be over 65



- About one in ten will be over 75!



Source: <http://www.bls.gov/opub/mlr/2012/01/mlr201201.pdf>

- Delayed retirements helping – but not the answer
- How to retain the younger workforce when you do get them hired?

# The Rest...



- **Consumers**
- **Water Treatment**
  - Pharmaceutical
  - Contaminants
  - Regulatory / Political
- **Industry Leadership**
- **Macro Factors (issues beyond the scope of the water industry)**
  - Global Warming, Climate Change
  - Population Growth
  - Environmental Activism
  - Lack of water inhibits economic development
- **Security**
- **Technology**
- **Energy**



# Issues in the news...



Search...

## Current Drinking Water Advisories for Ohio Public Water Systems



Use the list boxes to filter records.  
 Scroll down to view a summary or the details of the selected drinking water advisories.

EXHIBIT

Search Current Advisories

This site is updated Monday - Friday, except Holidays. Please Read the Disclaimer

99 advisories

**Reason for Advisory**

- 76 Contamination
- 3 Drought
- 20 Other

**Contaminant/Objective**

- 2 (missing this field)
- 3 Arsenic
- 5 Fecal coliform or E. coli
- 16 Fluoride
- 4 Haloacetic Acids (HAA5)
- 22 Lead
- 14 Total Coliform Bacteria
- 26 Trihalomethanes, total
- 7 Water Conservation

Community Nontransient Noncommunity Transient Noncommunity

**Public Water System Type**

- 61 Community
- 19 Nontransient Noncommunity
- 19 Transient Noncommunity

**Systems with Advisories**

- 1 5 Span Vacation Land
- 1 ACO Polymer Products Inc.
- 1 Angie's Pizza
- 1 Apple Creek, Village of
- 1 Archbold
- 1 Auburn Skilled Nursing and Rehab
- 1 Barberton City
- 1 Barberton City

**County**

- 2 Allen
- 1 Ashland
- 1 Ashtabula
- 1 Auglaize
- 4 Carroll
- 3 Clark

[SUMMARY](#) • [DETAILS](#)

99 advisories

Date	PWSID	System Name	Reason for Advisory	Contaminant/Objective	Advisory
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# AWWA – Industry Issues - Trends

	2007	2008	2009	2010	2011
1	REGULATORY	SOURCE WATER	BUSINESS FACTORS	BUSINESS FACTORS	<b>BUSINESS FACTORS</b>
2	SOURCE WATER	BUSINESS FACTORS	INFRASTRUCTURE	INFRASTRUCTURE	<b>INFRASTRUCTURE</b>
3	BUSINESS FACTORS	REGULATORY	REGULATORY	REGULATORY	<b>REGULATORY</b>
4	INFRASTRUCTURE	INFRASTRUCTURE	SOURCE WATER	SOURCE WATER	<b>SOURCE WATER</b>
5	WORKFORCE	WORKFORCE	WORKFORCE	WORKFORCE	<b>WORKFORCE</b>

***HOW CAN WE SOLVE INDUSTRY  
ISSUES...***

# Understand them, Map to Technology...

## Value Propositions

**REDUCED MAINTENANCE/  
ENERGY COSTS**

**WORKFORCE EFFICIENCY**

**PREDICTIVE & OPTIMIZED  
OPS & MAINT**

**BUSINESS AWARENESS  
DATA**

**WORKFORCE  
ACCOUNTABILITY**

**ENFORCED STANDARDS  
OPS & MAINT**

## Top Concerns

**BUSINESS FACTORS**

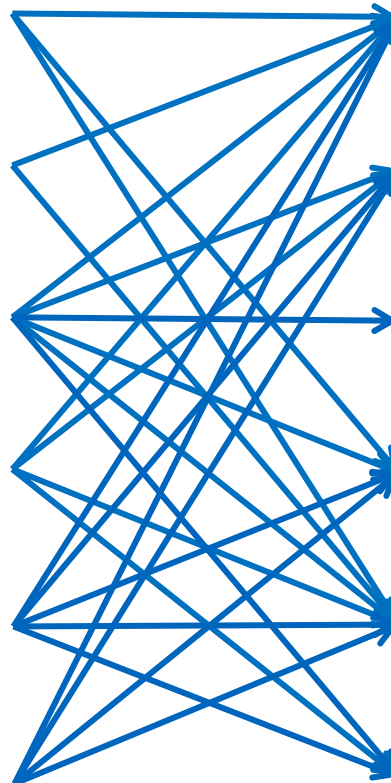
**REGULATORY**

**SOURCE WATER**

**INFRASTRUCTURE**

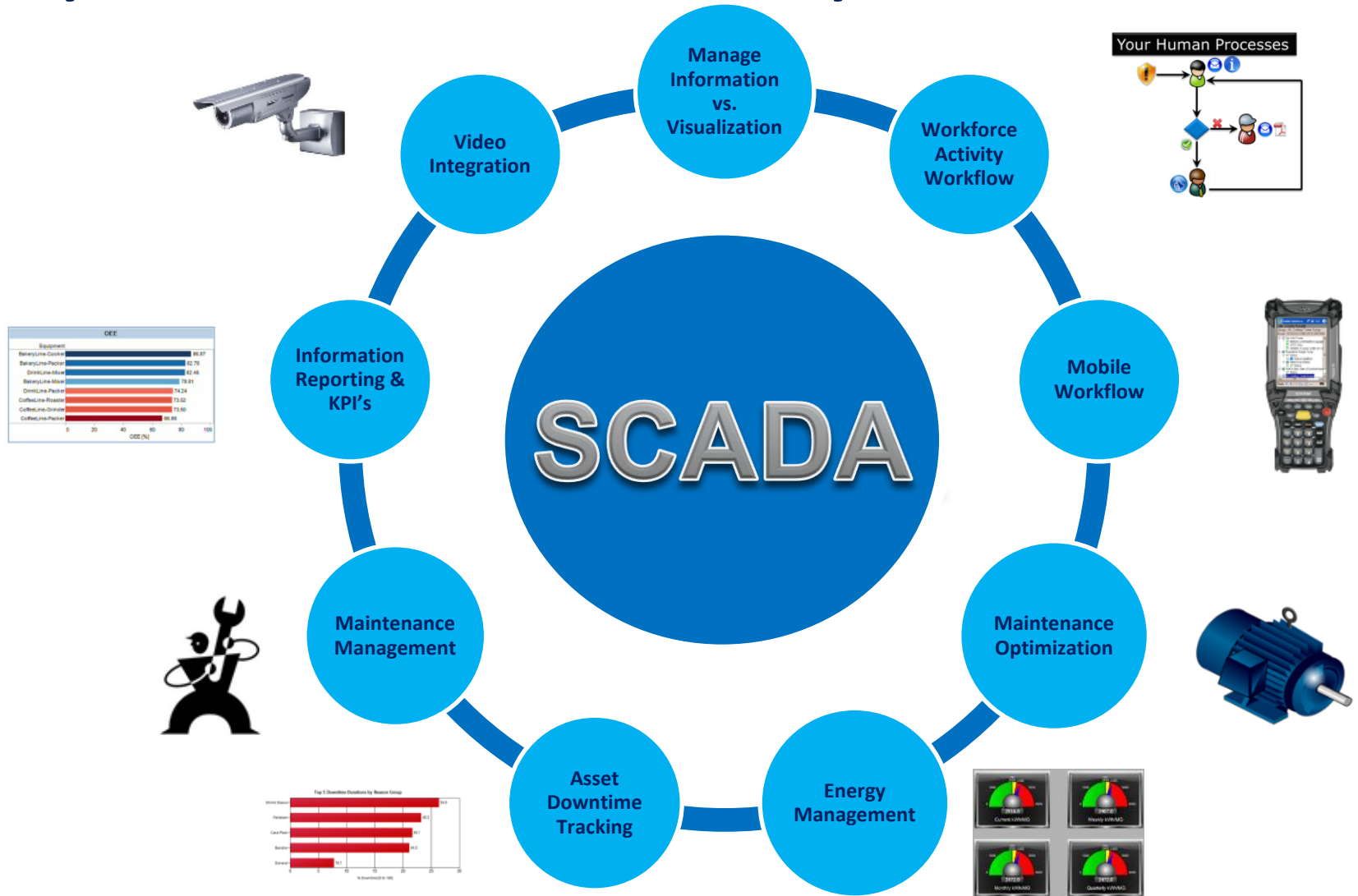
**WORKFORCE**

**SECURITY**

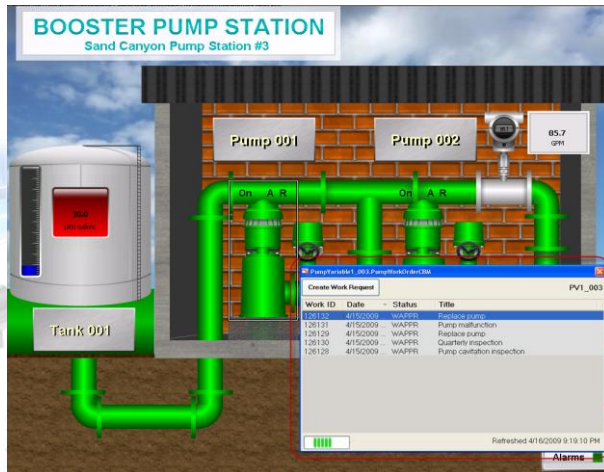


# ***THINKING BEYOND SCADA / VISION***

# Beyond SCADA... What's the story..?





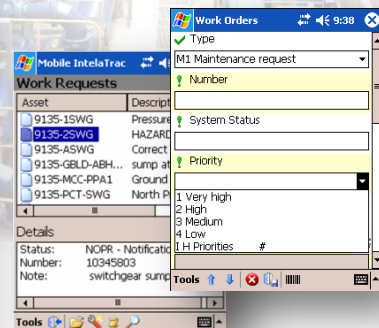


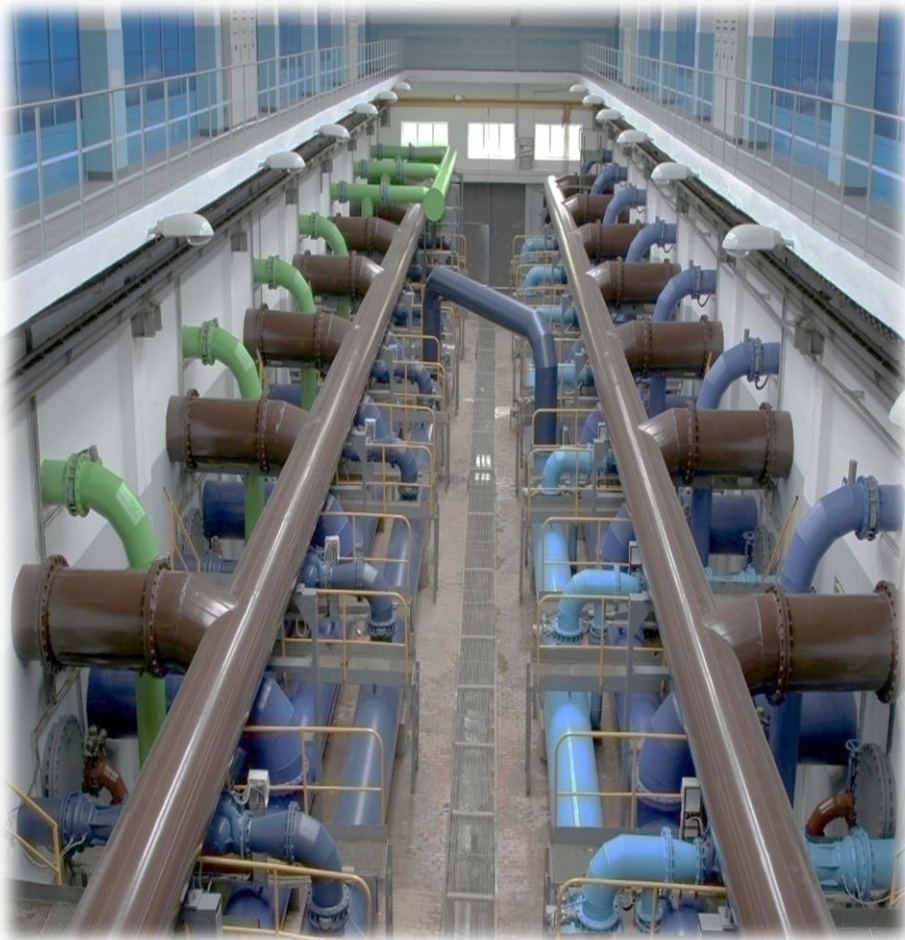
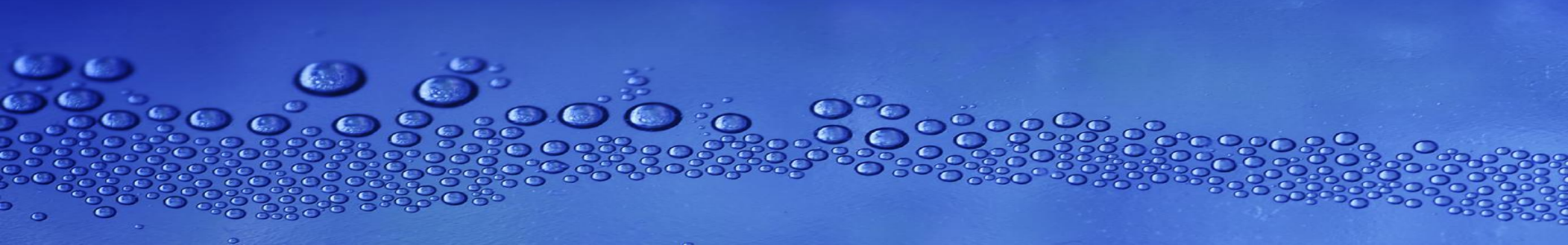
## Condition Based Monitoring

- Easy and powerful integration between HMI/SCADA and the most popular CMMS/EAM packages
- Real-time monitoring for optimized maintenance

## Mobile Solutions

- Interact with CMMS/ Asset Management in the field
- Enforce workflows
- Mobile workforce management solutions
- Easier compliance, improved asset effectiveness and enforcement of best operational practices





## Corporate Energy Management

- Get a grasp of the energy usage and costs in your water or wastewater operations

## Workflow

- Manage and guarantee your processes
- Ensure the correct actions is ALWAYS taken
- Improve efficiency, create standards and apply measurements to your human resources.

# ***CONDITION BASED MAINTENANCE***

- **CONDITION BASED MAINTENANCE**
- **MOBILITY**
- **ENERGY MANAGEMENT**
- **WORKFLOW**

# Maintenance Strategies... Where are you..?

- **Run-To-Failure** – Simplest approach, fix it when it breaks
- **Preventive Maintenance (PM)** – Calendar-based inspection & maintenance
- **Condition-Based Maintenance (CBM)** – Monitor equipment condition, maintenance based on actual condition. “maintain the right equipment at the right time”





# What is the Problem..?

1. 25% of all failures are preventable but not prevented because of an arbitrary decision that is simply not rooted in knowledge or experience.
2. 15% of all failures are predictable but not predicted.
3. 20% of all failures are predicted but not stopped to undertake repair.
4. 25% of all failures are predicted and equipment is shut down.
5. 14% are other (consequential to an external activity).
6. 1% of all failures are neither preventable nor predictable.
7. **Machines don't Die we kill them.**

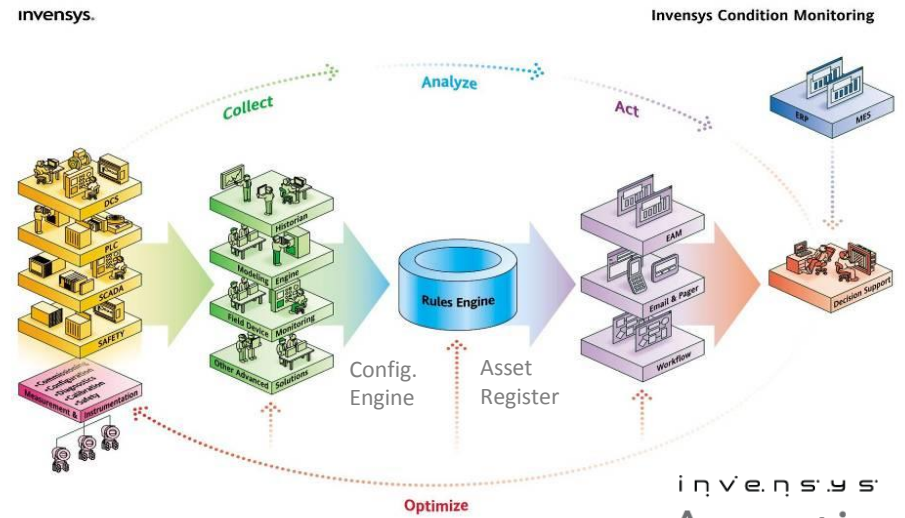
# Why do CBM..?

- Advance warning enables optimal repair schedule to minimize disruption
  - ✓ 80-85% of failure is TIME-RANDOM
- Less uncertainty and risk about equipment
- Increased safety of O&M personnel
- Help maintenance planner prioritize maintenance



# Condition Based Maintenance Approach...

Collect, Analyze, Act



GE Intelligent Platforms

SimSci-Esscor



ABB

Honeywell



OSIsoft



invensys



invensys  
Avantis



Archestra Workflow



# Analyze: with Condition Manager...

CM is able to monitor and aggregate more than one Real Time Point (RTP) from different sources.

- ✓ Lubrication based on **motor run-time**.  
(after 3,000h create a Lubrication activity requesting Lubricant from the Warehouse, with operations providing the resource)
- ✓ Monitor the Motor Bearing **Temperature**.  
(If exceeded create a WO bearing replacement)
- ✓ Compare **Pump Power consumption** with **Volume Flowrate** to detect mechanical degradation of pump  
(highlighted by excessive power consumption for know pumping capacities)
- ✓ Compare **Temperature, Vibration, Density, RPM, etc** to detect mechanical degradation.

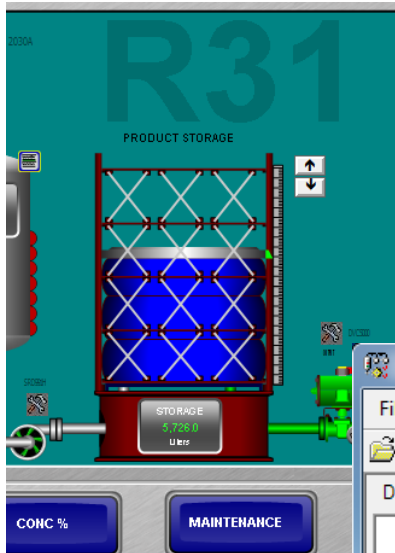


# ACT: Conditioned Maintenance Event generated...

Configurator will display state as of most recent update cycle:

**YELLOW:** A reading of interest was found during most recent update cycle (i.e. some of the criteria for the generation rule was met) but an action was not triggered

**RED:** An action was triggered during most recent update cycle



Condition Manager Configurator

File View Tools Help

prodlevel

Data Source - Real Time Points

- Cursor
- Cursor2
- Cycle
- HorizontalMove
- maintmode
- MixerRuntime
- MouvHorizontal
- MouvVertical
- PLDec
- ProdLevel**
- ReactLevel
- ReactTemp
- SetPoint

Entity - Statistics

- Company 1 XYZ
- Division 10 Utilities
- Component DVC5000 FISHER FIELDVUE DVC5000 POSITIONER(\*)
  - Device Status
  - Device Temp Reading
  - Stiction (ProdLevel, Output Valve)**
- Component SRD991H FOXBORO SRD991H VALVE POSITIONER
- Family INST Instrumentation Equipment
- Division 70 Facilities Maintenance Operations
- Division 20 Manufacturing

Condition Manager - Real Time Point Details

The following dialog displays the current value as well as some details about the selected real time point.

RTP: [InSql\Analog Tags\ProdLevel]  
Path: [InSql][Analog][ProdLevel]

Name	Value
Current Value	5363
Update Time	5/31/2013 11:50:45 AM
Quality	Good
QualityDetail	192
OPCQuality	192
wwRetrievalMode	DELTA
wwTimeDeadband	0
wwValueDeadband	0
wwTimeZone	Eastern Daylight Time
wwParameters	0
Description	Product storage level
TagType	Analog

Refresh OK

# ACT: Actions triggered...

Work Order Generated  
into EAM.....

Work Order	Task	Title	Task Status	Start no Earlier Than	Finish no Later Than	PM Job	PM Tε
9900417	1	Valve Stiction - Valve Stiction	Not Started	5/31/2013	6/1/2013		

Valve Stiction - M

File Message Developer

Ignore X Reply Reply All Forward Meeting Planner Planner To Manager

Delete Respond Quick Steps

Extra line breaks in this message were removed.

From: condition.manager@invensys.local  
To: maintenance@invensys.local  
Cc:  
Subject: Valve Stiction

DVC5000\_Stiction - 5/31/2013 5:36:02 AM  
[AVW732VM\_ProdLevel][7909 ;OK;05:36:01;C]  
[AVW732VM\_OutputValve][1 ;OK;05:36:01;C] Work Order/Request [9900417] was create

Email sent to the Maintenance  
Manager....

# Discussion - ISSUE MAPPING – CBM

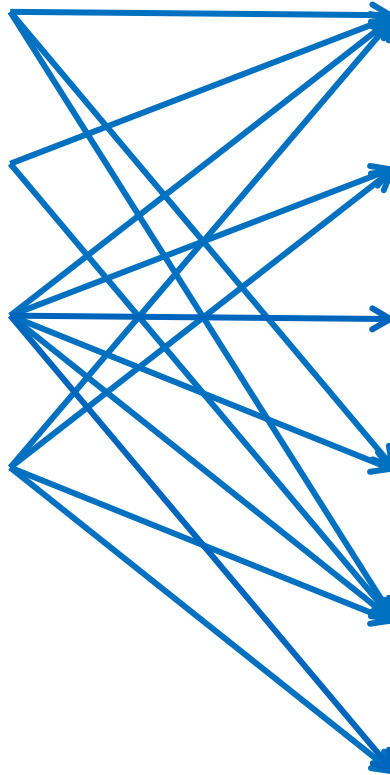
## Value Propositions

**REDUCED  
MAINTENANCE COSTS**

**WORKFORCE  
COLLABORATION**

**REDUCED SERVICE  
INTERRUPTIONS**

**OPERATIONAL  
AWARENESS**



## Top Concerns

**BUSINESS FACTORS**

**REGULATORY**

**SOURCE WATER**

**INFRASTRUCTURE**

**WORKFORCE**

**SECURITY**

# ***MOBILITY***

- **CONDITION BASED MAINTENANCE**
- **MOBILITY**
- **ENERGY MANAGEMENT**
- **WORKFLOW**



# Challenges facing (Company) in the (Industry)...

- Moving from Re-active to Pro-active Asset Performance Operations
- Predicting and correcting issues before they impact the Infrastructure
- Increasing Life Expectancy of the Infrastructure's Assets
- Increasing Focus on Asset performance and Optimization
- Maximize Reliability and Availability, Balanced with Utilization
- Managing Risk
  - Financial
  - Environmental, Health and Safety
  - Regulatory, Culture
- Dealing with an Aging Asset Base and Workforce
- Continued Pressure to Reduce Costs
- Other Plant & Facility Management Issues
  - Visibility of non-instrumented equipment
  - Procedure (SOP) management
  - Task management & workforce scheduling optimization
  - Plant maintenance & turnaround management

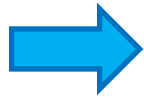


# Mobility Provides Visibility into the Performance of Non-Instrumented Equipment (40 – 60% of assets)

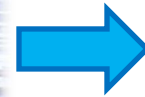


# The Traditional Approach for manual rounds...

Differential pressure noted on paper based system



Field results turned in at end of round



(IF) Data entered into reporting package



*Expected result should be:*

- Pipe Repair (scheduled) \$10K

*Unexpected result COULD be:*

- Collateral Repairs \$ ??
- Lost Service \$ ??
- Time to Repair ?? Days
- Lawsuits, +, +, + \$ ?? + social



Pump fails and secondary damage occurs



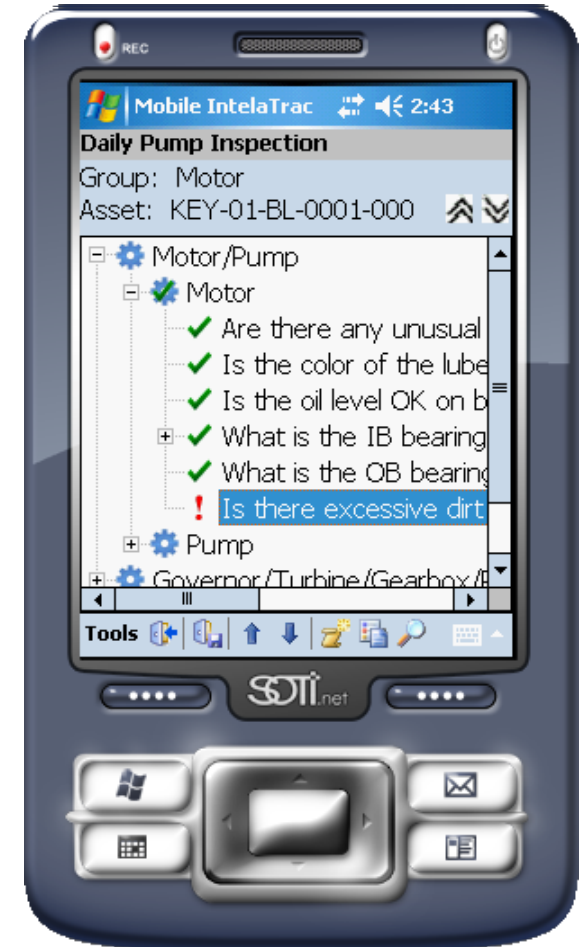
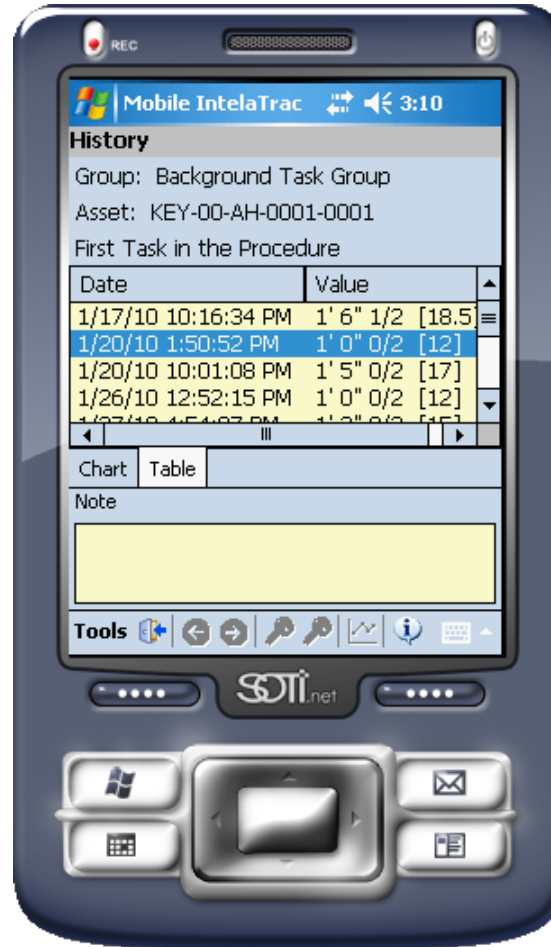
Hours later (IF) data is reviewed



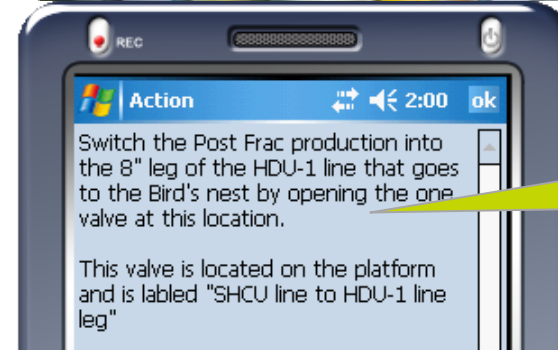
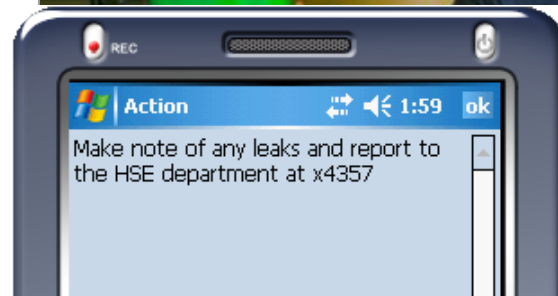
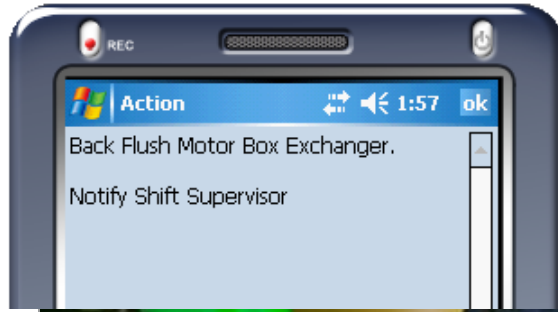


# Mobile – Rounds & Procedures...

- Presented with Tasks
  - Using Defined Pick Lists
  - Device / Virtual Keyboard
  - Peripheral Devices
- History
  - Includes Notes
  - Tabular



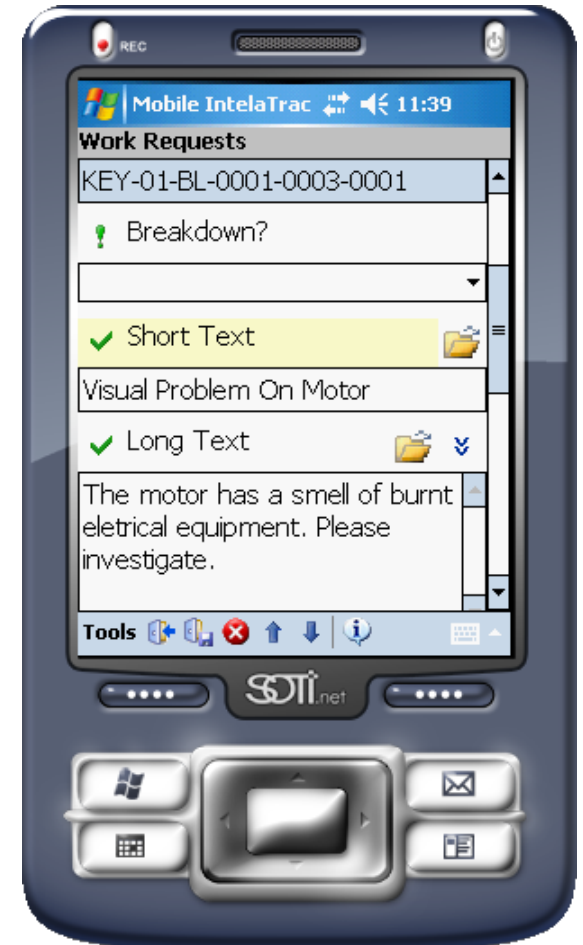
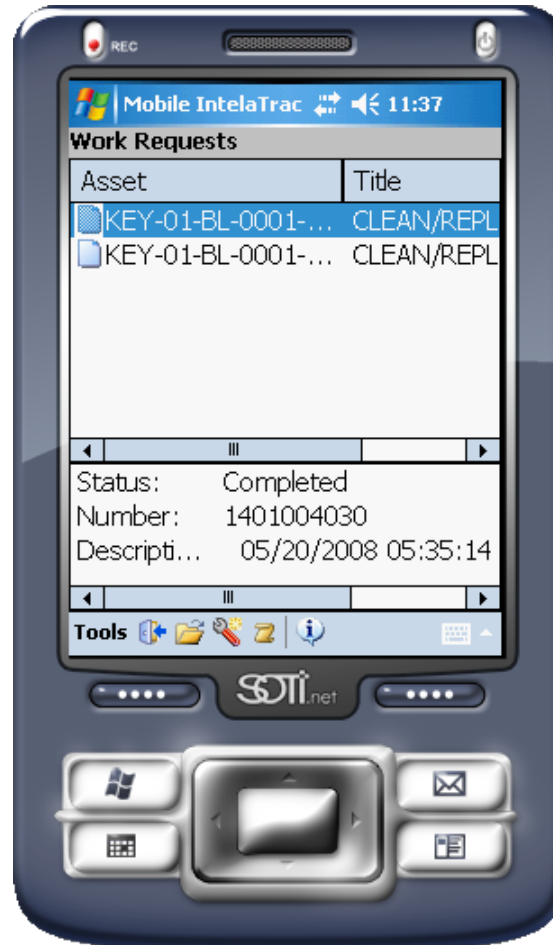
# Mobile - Focused Advice and Escalations...



Message Text can be calculated  
Could be delivered from an external system at run time

# Mobile - Create & View Work Requests...

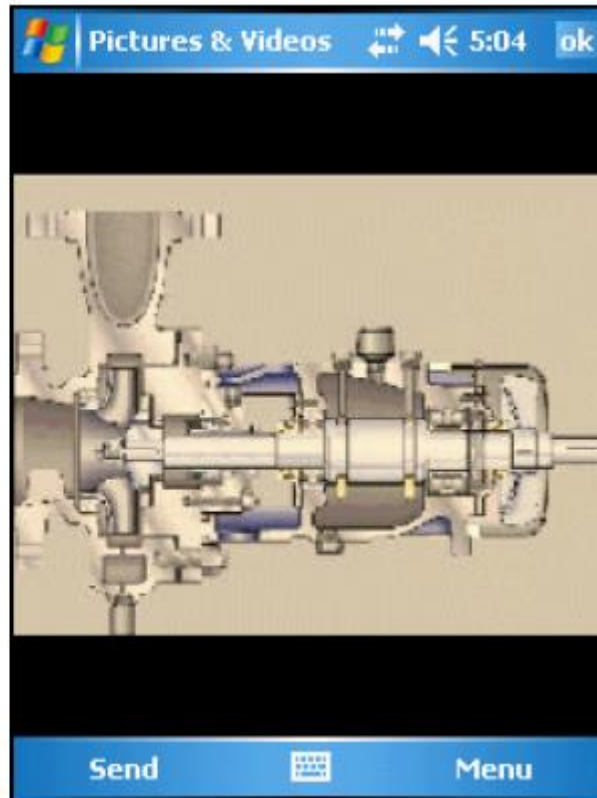
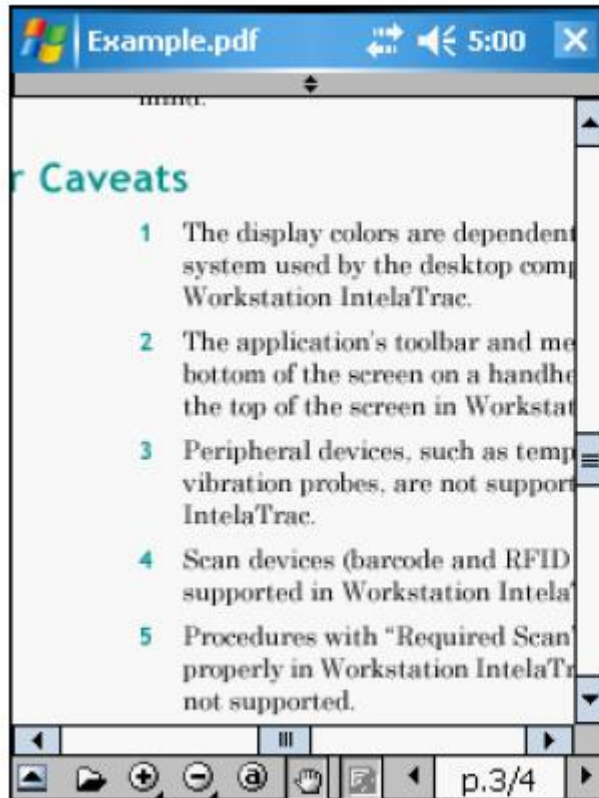
- Review Existing Work Requests
- Create an ad-hoc Work Request
- Lists defined by CMMS
- Work Request Triggered from an Action
- Existing Requests are displayed for review





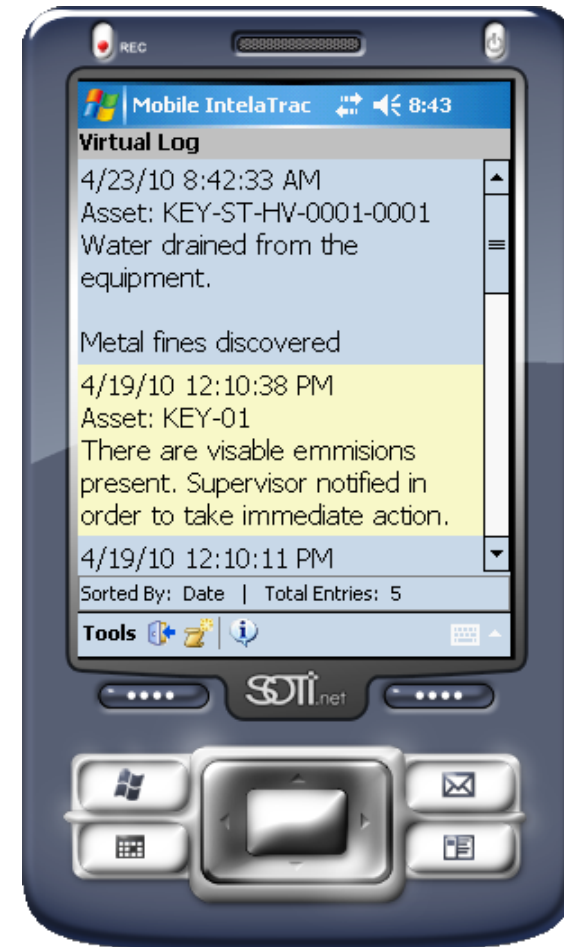
# Mobile- Attached Documents...

Attached Documents provide a method to include additional information (usually reference material), in the form of a PDF, graphic, or spreadsheet, with a Procedure.



# Mobile – Free Text Notes & Logbook...

- Free Text notes may be added at any time
- Or...triggered by an Action
- Enter free text or select a default note
- Default Notes can be edited
- Note is also available as a Log Entry



# Discussion - ISSUE MAPPING – Mobility

## Value Propositions

**REDUCED  
MAINTENANCE COSTS**

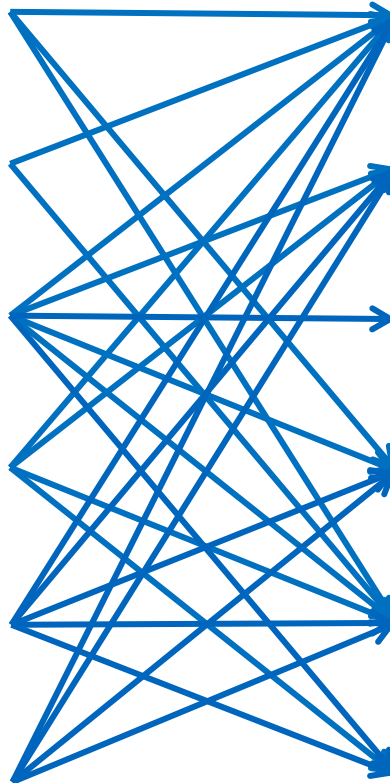
**WORKFORCE  
COLLABORATION**

**REDUCED SERVICE  
INTERRUPTIONS**

**OPERATIONAL  
AWARENESS**

**WORKFORCE  
ACCOUNTABILITY**

**ENFORCED STANDARDS**



## Top Concerns

**BUSINESS FACTORS**

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**SOURCE WATER**

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**SECURITY**

# *Beyond SCADA in PRACTICE...*

# Pima County Regional Wastewater Reclamation



## The Problem:

- Manual Rounds
- Poor ability to visualize information
- No guarantee of round completion
- Data Entry Labor
- Data Entry Delay
- Data Entry Mistakes



Regional  
Wastewater  
Reclamation  
Department

# Part of the Problem - The Rounds Sheets...

Area # 7 Air Blowers & Grit Pumps

Area # 5 Fine Screenings

BUILD#

DATE 1-10-13

DATE 1-10-13

MIDS Days SWINGS

3 Harris Days SWINGS

MIDS Harris		
TIME:	2400	0400
RAW INF LEL	0	0
RAW INF H2S	3.6	1.3
COARSE BAR SCREEN	ON/OFF	ON/OFF
SCREEN 1	ON	ON
SCREEN 2	-	-
TIMER (ON/OFF)	OFF	OFF
CONVEYOR	CH'D/OK	CH'D/OK
Conveyor oil	CH'D/OK	CH'D/OK
Hopper level	FEET	FEET
	2.07	2.0
SCREW PUMP	FEET	FEET
INLET LEVEL	2.07 1.45	1.0

Emerge		
Overflow To	(Yes/No)	(Yes/No)
Pond	N/D	N/D
Pond #2 Level	MT	MT
Return Valve	OPEN/CLOSED	OPEN/CLOSED
From #2 to #1	closed	closed
Pond #3 Level	closed MT	MT
Return Valve	OPEN/CLOSED	OPEN/CLOSED
From #3 to #1	closed	closed
RPM	OFF	OFF
Vacuum		
Fuel Level	↓	↓

Comments:

Time:	2400	0400	0800	1200	1600	2000
	psi	psi	psi	psi	psi	psi
Process air manifold	3.09	2.99	3.02			
Air blower #1 on/off	OFF	-	OFF			
Air blower #1 (vacuum)	-	-	-			
Air blower #1 receiver	-	-	-			
Air blower #2 on/off	OFF	-	OFF			
Air blower #2 (vacuum)	-	-	-			
Air blower #2 receiver	-	-	-			
Air blower #3 on/off	ON	ON	ON			
Air blower #3 (vacuum)	0	1	2			
Air blower #3 receiver	5.2	5.2	4.4			
Air blower #4 on/off	OFF	-	OFF			
Air blower #4 (vacuum)	-	-	-			
Air blower #4 receiver	-	-	-			
Grit Pumps						
Grit pump #1 (loc/remote)	ON	ON	ON			
G.P.#1 seal water	6.1	6.1	6.1			
G.P.#1 packing ck'd/ok	OK	OK	OK			
G.P.#1 inlet psi	2	2	2			
G.P.#1 outlet psi	15	16	14			
Grit pump #2 (loc/remote)	OFF	-	OFF			
G.P.#2 seal water	-	-	-			
G.P.#2 packing ck'd/ok	-	-	-			
G.P.#2 inlet psi	-	-	-			
G.P.#2 outlet psi	-	-	-			
Grit pump #3 (loc/remote)	ON	ON	ON			
G.P.#3 seal water	6.0	6.5	6.0			
G.P.#3 packing ck'd/ok	OK	OK	OK			
G.P.#3 inlet psi	1	1	1			
G.P.#3 outlet psi	15	15	14			
Grit pump #4 (loc/remote)	OFF	-	OFF			
G.P.#4 seal water	-	-	-			
G.P.#4 packing ck'd/ok	-	-	-			
G.P.#4 inlet psi	-	-	-			
G.P.#4 outlet psi	-	-	-			
Grit pump #5 (loc/remote)	OFF	-	OFF			
G.P.#5 seal water	-	-	-			
G.P.#5 packing ck'd/ok	-	-	-			
G.P.#5 inlet psi	-	-	-			
G.P.#5 outlet psi	-	-	-			
Seal water for grit pump.	P/S	P/S	P/S	P/S	P/S	P/S
Truck Bay Sump						
sump pump #1	ck'd/ok	ck'd/ok	ck'd/ok	ck'd/ok	ck'd/ok	ck'd/ok
run time hours	2125.7	2125.9	2125.1			
sump pump #2	ck'd/ok	ck'd/ok	ck'd/ok	ck'd/ok	ck'd/ok	ck'd/ok
run time hours	2167.6	2167.9	2167.0			

PUMP DOWN SUMP TO THE LOW LEVEL ALARM ONCE PER SHIFT. DO NOT LEAVE PUMP UNATTENDED.  
V 0745

2400	0400	0800	1200	1600	2000
ON	ON	ON			
ON	ON	ON			
OFF	-	OFF			
ck'd/ok	ck'd/ok	ck'd/ok	ck'd/ok	ck'd/ok	ck'd/ok
Hand	Hand	Hand			
HUBER WASHER / COMPACTORS					
Physically check washer / compactor and hopper every round					
! / Auto	1 / 2 / Auto	1 / 2 / Auto	1 / 2 / Auto	1 / 2 / Auto	1 / 2 / Auto
Auto	Auto	Auto			
ck'd/ok	ck'd/ok	ck'd/ok	ck'd/ok	ck'd/ok	ck'd/ok
OK	OK	OK			
OK	OK	OK			
bet	feet	feet	feet	feet	feet
93	1.0	1.2			
mer	Timer	Timer	Timer	Timer	Timer
off	on/off	on/off	on/off	on/off	on/off
ON	ON	ON	04:35/5:00		
ON	ON	ON	04:35/5:00		
5	0.5	-	OFF		
psi	psi	psi	psi	psi	psi
2	6.2	3.2			
5	6	6.2			
et	feet	feet	feet	feet	feet
43	1.57	2.18			



# Digitizing the Headworks Round...

The screenshot displays the IntelTrac Management Center interface, specifically the Procedure Builder tool. The interface is divided into several sections:

- Navigation Panel (Left):** Contains various management and reporting tools such as Content Management, Scheduling, Workstation, Review, Reporting, Administration, and Documentation.
- Procedure Builder (Center):** The main workspace showing a tree view of process categories. Under "Water & WasteWater", the "Operations" sub-category is expanded to show "Fine Screenings" (with a green checkmark icon) and "Grit Pumps and Air Blowers" (with a yellow sun icon). A prominent blue button labeled "Headworks" is visible at the bottom of this list.
- Toolbox (Right):** A vertical panel containing various procedural elements categorized into Procedure Items, Actions, Integrations, and Peripherals.

**Procedure Items:**

- Task Group
- Decision
- Task
- Condition

**Actions:**

- Force Calculation
- Jump
- Message
- Note
- Launch Procedure
- Work Order Request

**Integrations:**

- Production Data
- Experion
- IP21
- OSI
- PHD
- Wonderware Historian
- Wonderware Galaxy
- IntelTrac Tag

**Peripherals:**

- RFID
- VIBTOOL
- Barcode
- SKF® CMVL3600-IS MCD Prol
- Cyclops 100 / 390 Temperatu
- Raynger MX4 Series Tempera

# Digitizing the Headworks Round...

The screenshot displays the 'Procedure Builder' software interface. On the left is a 'Toolbox' with categories: Procedure Items (Task Group, Decision, Task, Condition), Actions (Force Calculation, Jump, Message, Note, Launch Procedure, Work Order Request), Integrations (Production Data, Experion, IP21, OSI, PHD, Wonderware Historian, Wonderware Galaxy, IntelTrac Tag), and Peripherals (RFID, VIBTOOL, Barcode, SKF® CMVL3600-IS MCD Pro, Cyclops 100 / 390 Temperatu, Raynger MX4 Series Tempera).

The main workspace shows a workflow diagram titled 'Headworks'. The flow is as follows: 'Raw Influent Tasks' leads to 'Raw Influent LEL', which triggers the 'LEL to Galaxy' integration. This is followed by 'Raw Influent H2S', which triggers the 'H2S > 6 PPM' condition, leading to 'H2S to Galaxy'. The flow concludes with 'Course Bar Screen Tasks'.

The 'Integration' configuration panel for 'LEL to Galaxy' is shown below the diagram. It includes the following fields and options:

- Integration Server: WasteTreatment
- Title: LEL to Galaxy
- Tag Name: LEL.LELManualInput
- Integration Type:  Mobile,  Server
- Timestamp options:  Timestamp of Task,  Fixed Timestamp,  Timestamp Of Procedure Node,  Value of Selected Task

A red warning message is displayed: "Data transfer does not necessarily occur real time and data may be sent sequence. Proceed with caution when writing to a real-time control system! Wonderware Galaxy that may trigger events."

# Headworks Round - old & new...

As Examples:

- Hydrogen Sulfide
- Lower Explosive Limit

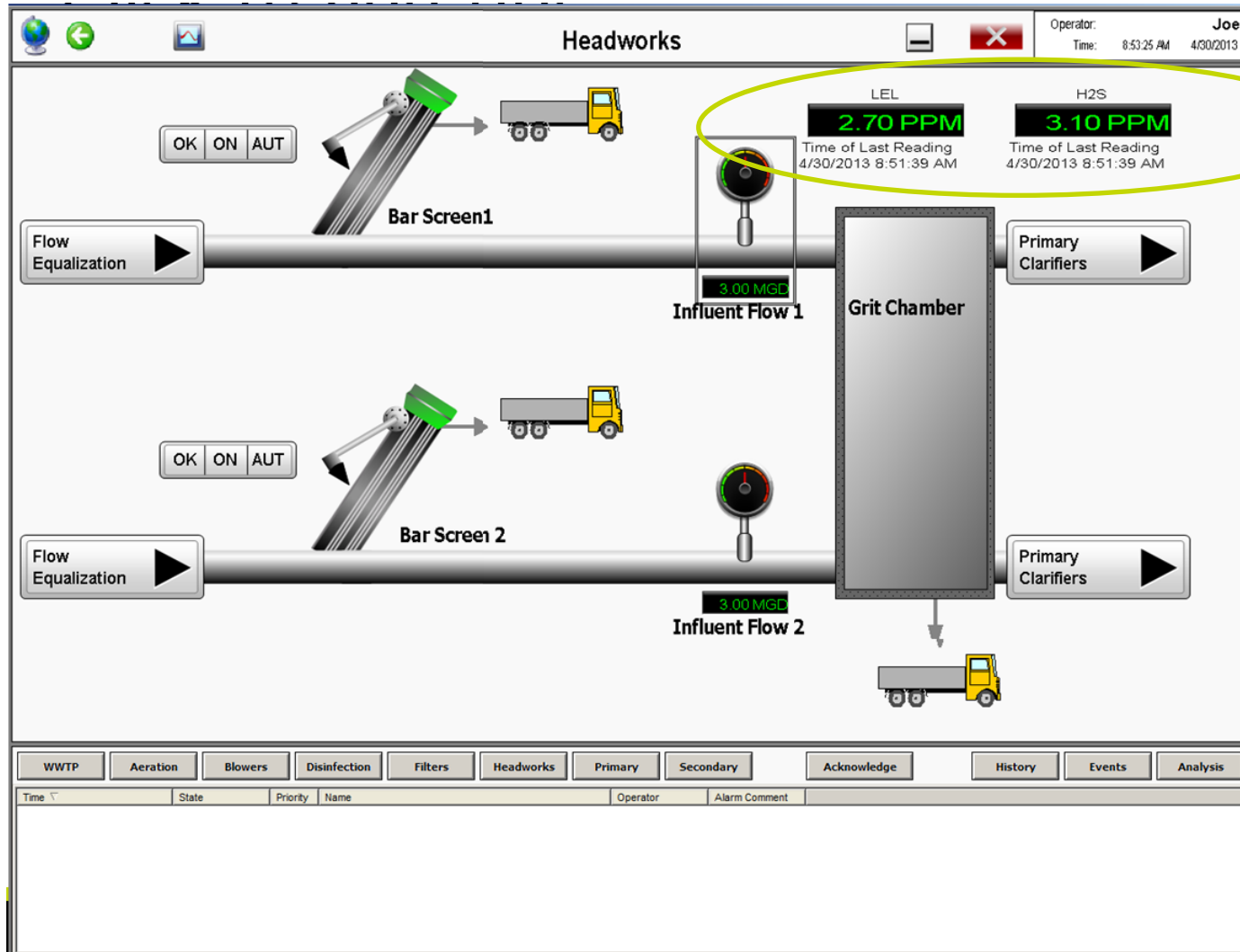
BUILDING 30: HEADWORKS

DATE 1-10-13

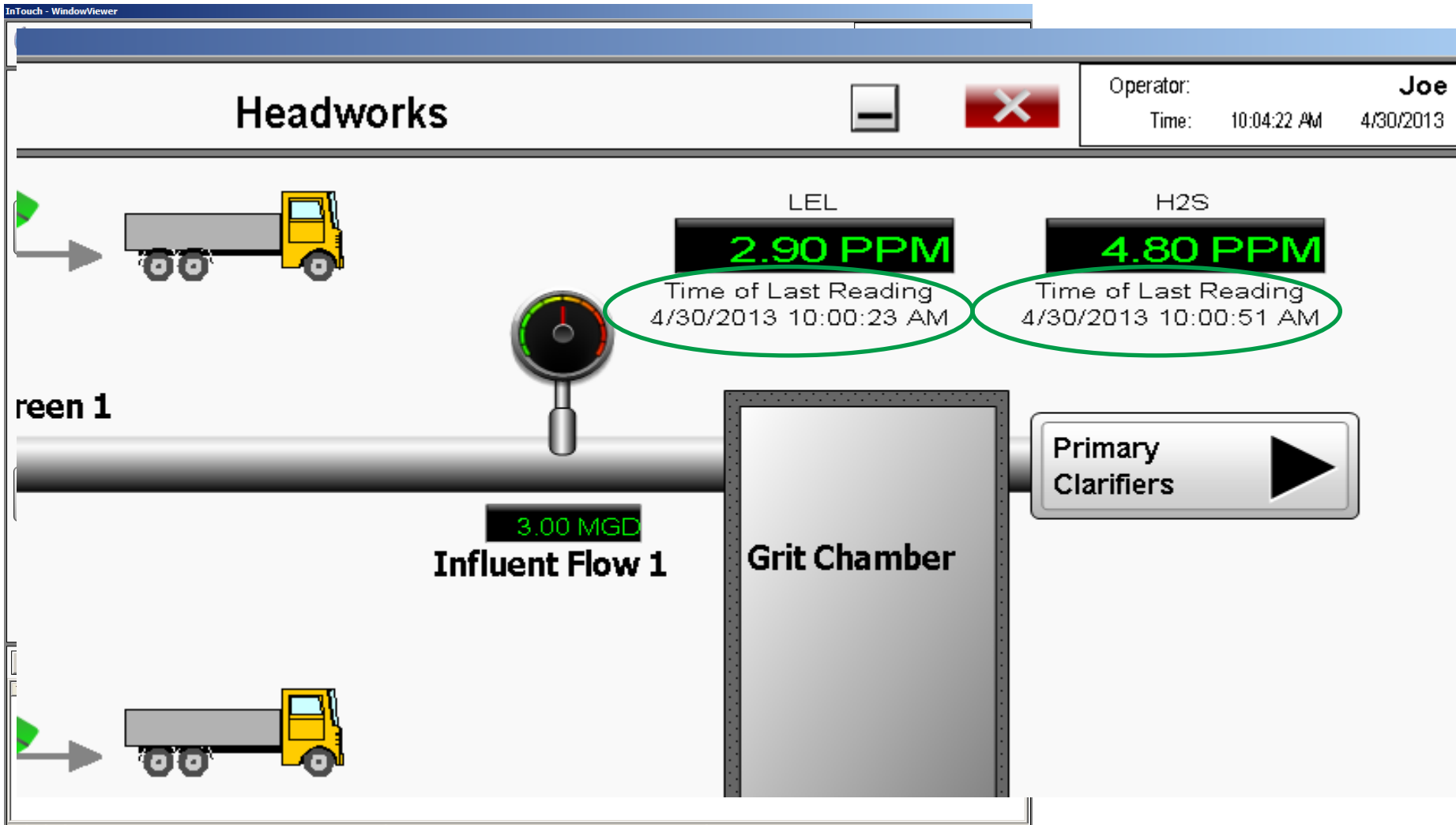
	MIDS <u>HARRIS</u>			Days <u>HARTMAN</u>			SWINGS		
TIME:	2400	0400	0800	1200	1600	2000			
RAW INF LEL	0	0	0						
RAW INF H2S	3.6	.3	0.3						
<b>COARSE BAR SCREEN</b>									
COARSE BAR SCREEN	ON/OFF	ON/OFF	ON/OFF	ON/OFF	ON/OFF	ON/OFF			
SCREEN 1	ON	ON	ON						
SCREEN 2	-	-	OFF						
TIMER (ON/OFF)	OFF	OFF	MANUAL						
CONVEYOR	CH'D/OK	CH'D/OK	CH'D/OK	CH'D/OK	CH'D/OK	CH'D/OK			
	OK	ON	✓OL						
Conveyor oil	CH'D/OK	CH'D/OK	CH'D/OK	CH'D/OK	CH'D/OK	CH'D/OK			
	OK	ON	✓OL						
Hopper level	FEET	FEET	FEET	FEET	FEET	FEET			
	2.07	2.0	2.5						
SCREW PUMP	FEET	FEET	FEET	FEET	FEET	FEET			
INLET LEVEL	<sup>1.45</sup> 2.07	1.0	0.9						

Emergency Overflow Ponds

# Stranded Data with SCADA – Synched...



# Post Round Stranded Data – Synched to SCADA...



# ***ENERGY MANAGEMENT***

- **CONDITION BASED MAINTENANCE**
- **MOBILITY**
- **ENERGY MANAGEMENT**
- **WORKFLOW**



# Main cost factors...

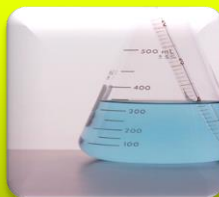
The major cost factors in the operation of Water & Wastewater utilities are:



Labor



Energy

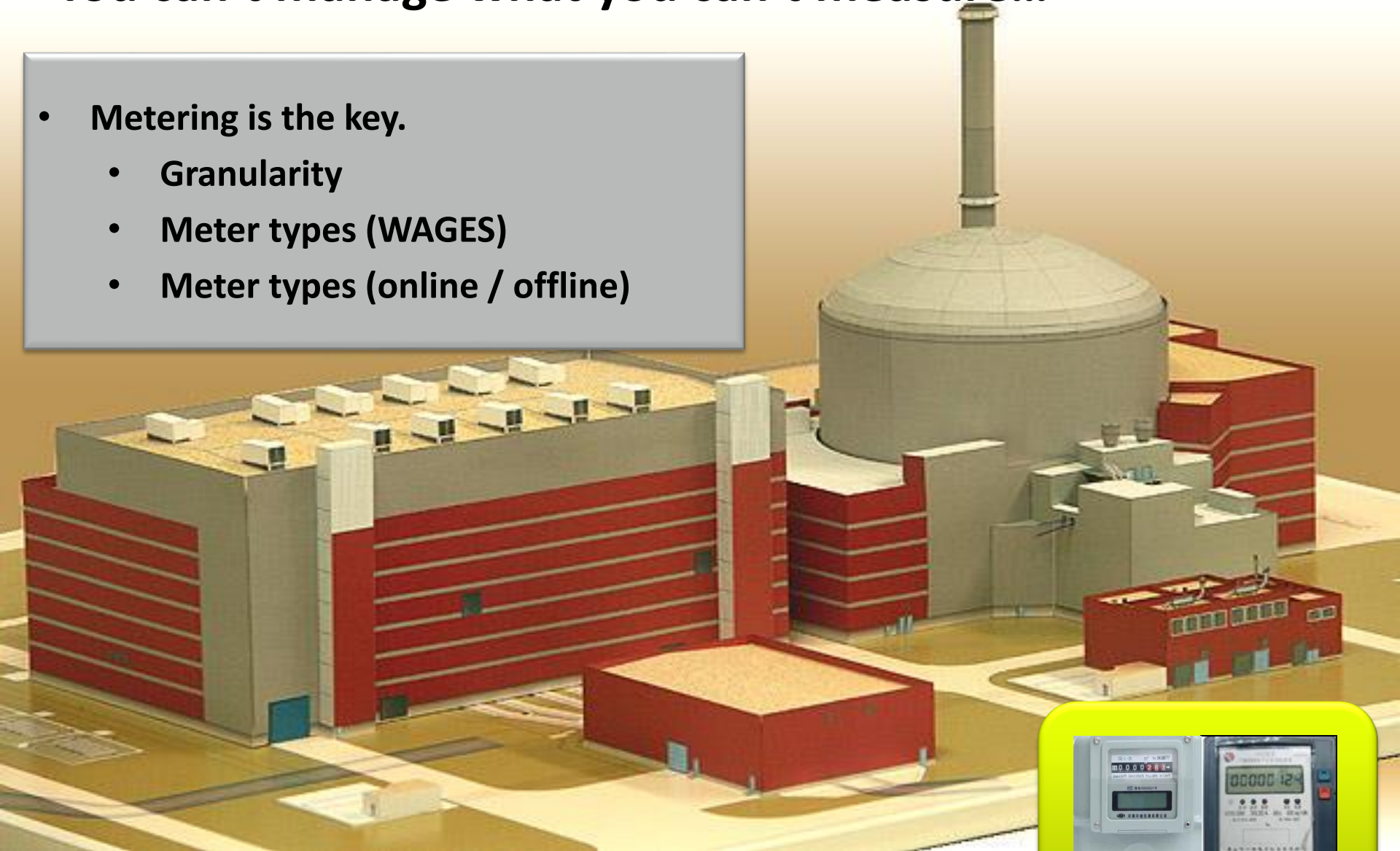


Chemicals

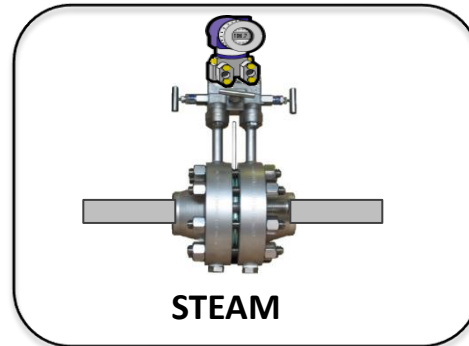
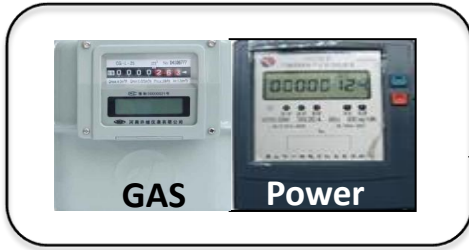
and the bad news is, **NONE** of them are expected to **EVER** go down...


# You can't manage what you can't measure...

- Metering is the key.
  - Granularity
  - Meter types (WAGES)
  - Meter types (online / offline)



# What can I do with One Meter..?



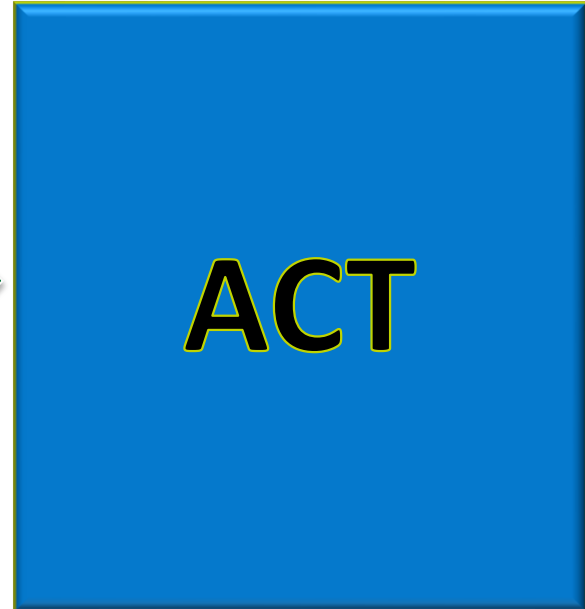
- Energy per Hour/Shift/Day/Month/Year
- Energy Per Bldg, sqM 

## What can I do with sub-meters?

- Energy per Hour/Shift/Day/Month/Year
- Energy Per floor, zone, room

# CHECK

Sample Reports, Dashboard, Data dissemination



Explain how EMS calculates GHg, etc.

Optimization Strategy  
Peak Demand Limiting  
Load Shedding  
Start-up Routine

Explain what is monitored by EMS

***THE FINISHED PRODUCT...***  
***Data... Verify and Validate***

# Report Data Should Drive Questions...

**Wonderware INFORMATION SERVER**

Period Cost Comparison Report

Start Date (Primary): Tuesday, November 17, 2009 12:00:00 AM  
End Date (Primary): Tuesday, November 24, 2009 12:00:00 AM  
Start Date (Secondary): Tuesday, November 10, 2009 12:00:00 AM  
End Date (Secondary): Tuesday, November 17, 2009 12:00:00 AM

Energy type	MIN	MAX	AVG	TOTAL
Gas Meter	4,836.10	274,975.04	148,536.75	594,147.00
Power Meter	2,019.96	18,927.74	9,324.43	37,297.00

	Max	Min
<b>Gas Meter €</b>		
mtr_Main_Gas	4,499.30	0.00
mtr_Roaster011_Gas	2,646.81	0.00
<b>Power Meter €</b>		
mtr_Roaster011_Power	418.98	0.00
mtr_Main_Power	430.56	0.00

Period Consumption

300000  
250000  
200000  
150000  
100000  
50000  
0

12/11/2009 21/11/2009 22/11/2009 24/11/2009 20/11/2009 13/11/2009

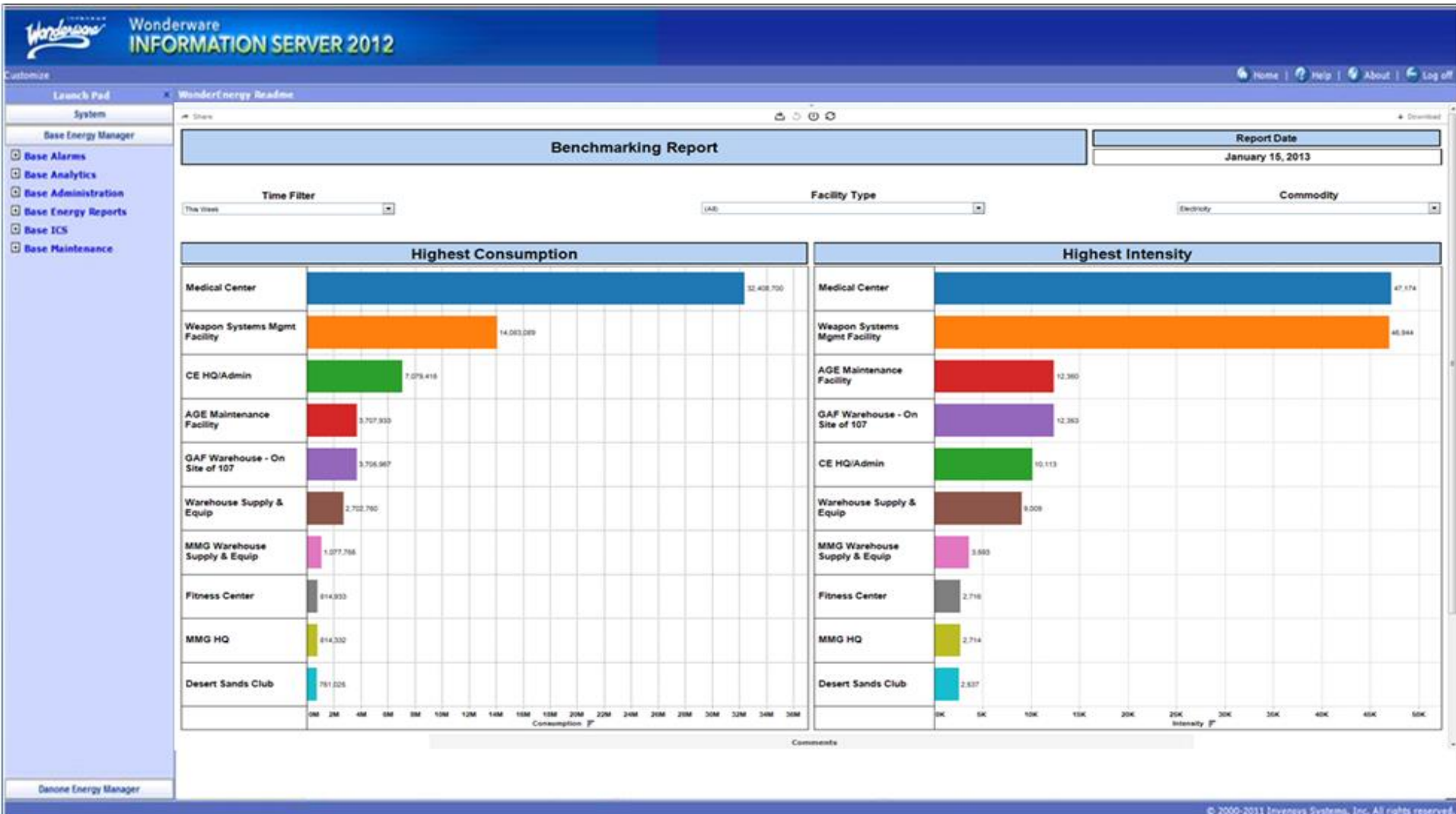
© 2000-2009 Invensys Systems, Inc. All rights reserved.  
Trusted sites

**In the last seven days of Operation...**

- How much Energy did I use?
- How much did it cost me to use this Equipment?
- What are the minimum, maximum and average Energy costs for this area of operation?
- What does the Energy consumption look like in a trend, over time, compared to last week?
- Was I better than last week..?



# Intelligent Dashboards, Smart Data – Drive Improvement...



***CONTINUOUS IMPROVEMENT...***

# Understanding Data Leads to Energy Saving Initiatives...

## ACT

- **Equipment selection**
  - Motor and pump selection
  - VFDs
  - AHU / HVAC
- **Optimizing supply efficiency**
  - Most cost-effective wells ( $\$/Gal \sim Kwh/Gal$ ) started first, turned off last.
  - Most energy efficient pumps started first, turned off last.
- **Time of Use pumping / cooling**
- **Best operating practices for you**
- **Optimizing water / steam pressure**
- **Reducing water / air leaks**
- **Reduce demand**
  - Conservation programs
- **Reduce peak load**
- **Water reuse**
- **Rate negotiation**



# Discussion - ISSUE MAPPING – Energy Management

## Value Propositions

**REDUCED ENERGY COSTS**

**PREDICTIVE MAINTENANCE**

**SUSTAINABILITY**

## Top Concerns

**BUSINESS FACTORS**

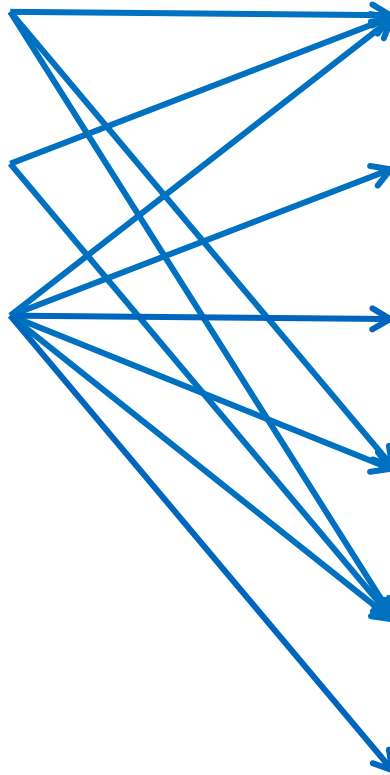
**REGULATORY**

**SOURCE WATER**

**INFRASTRUCTURE**

**WORKFORCE**

**SECURITY**



# ***WORKFLOW***

- **CONDITION BASED MAINTENANCE**
- **MOBILITY**
- **ENERGY MANAGEMENT**
- **WORKFLOW**

# The **KEY** is Standard Operating Procedures...



## Typical SOP's:

- On a bookshelf
  - In a binder
  - No accessible when needed
  - Never? Improved
  - Not seen as important UNTIL...
- 
- **Is it important to ensure your team responds to events in a standard, repeatable and proven way... every time..? regardless of training..?**





# Automated Workflows watch the **Process...** **waiting for something to happen...**



Time Events

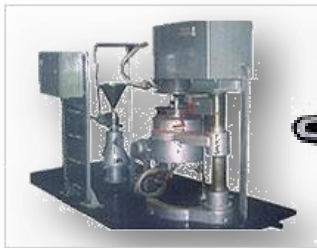


Machine Status

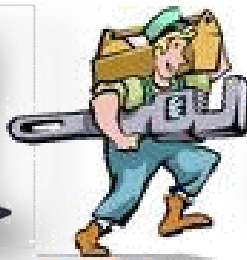
Operator Data Entry

Process Values

Business Transactions



Equipment



Operators



Process Control

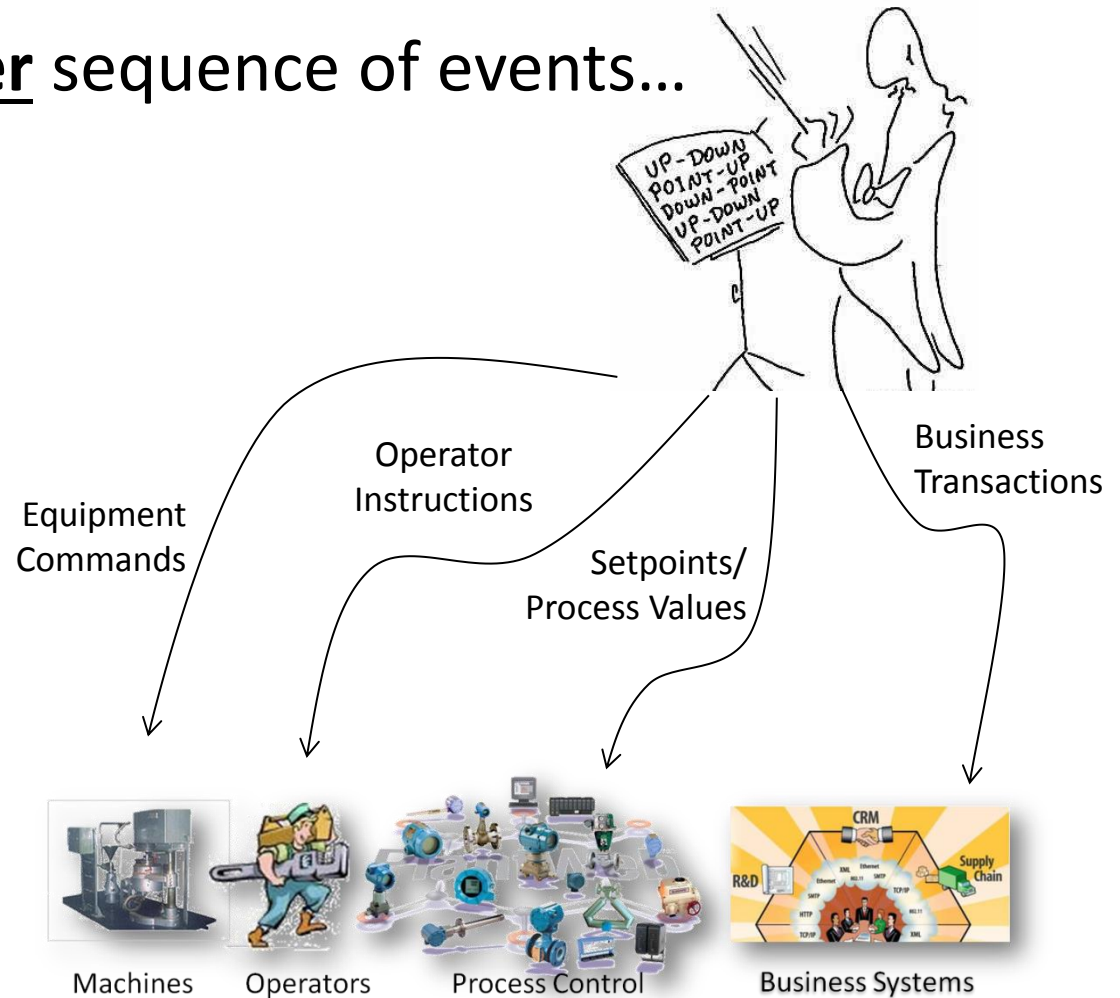
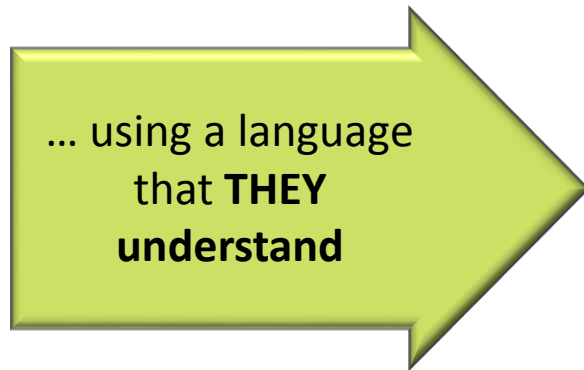


Business Systems

And **WHEN** it does, your Standard Operating Procedure takes over...

Initiating the proper sequence of events...

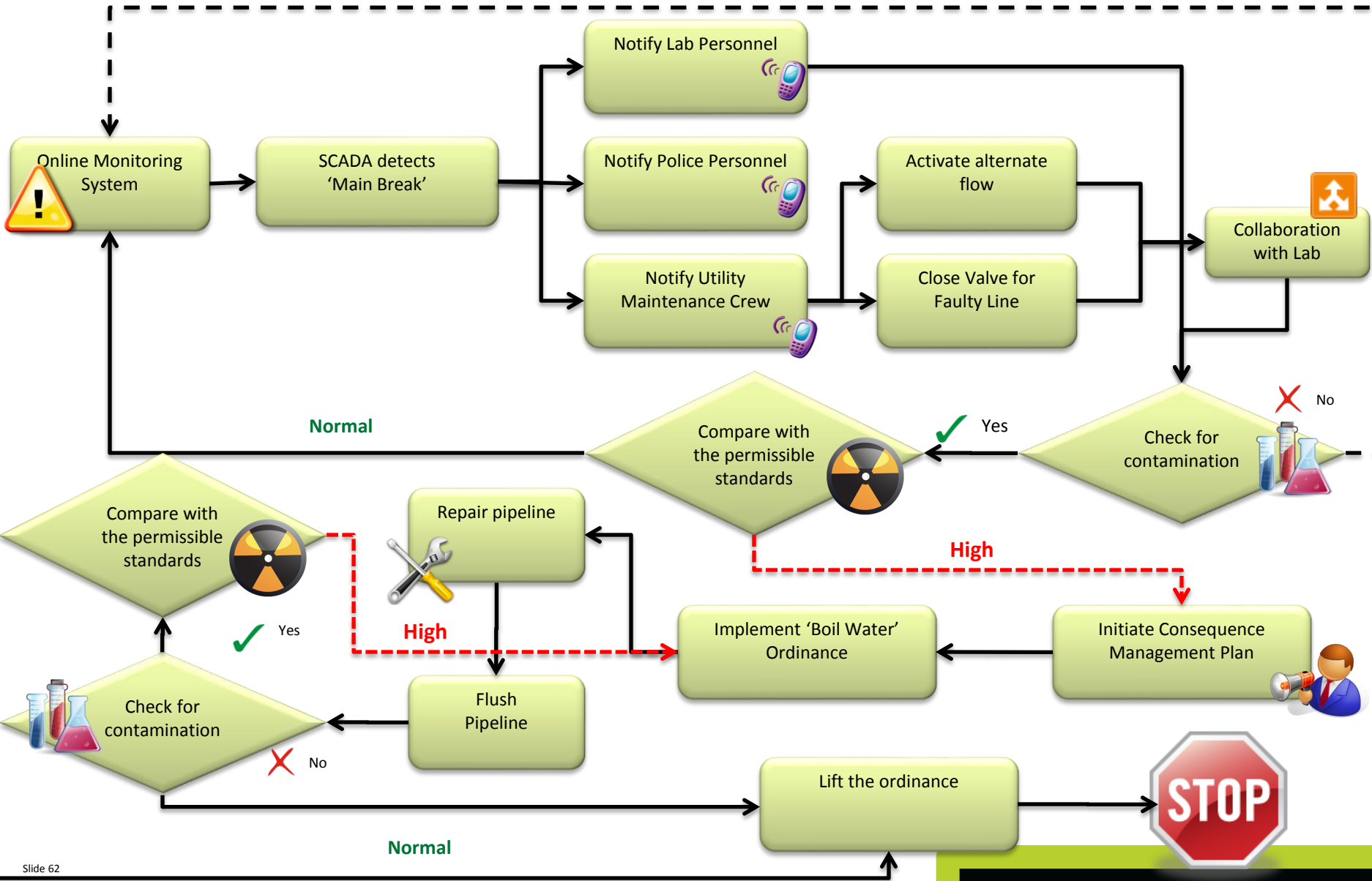
Every time...



# Examples of Workflows in Water & Wastewater Operations

- Alarm Handling – Corrective Actions
- Diagnostics and Troubleshooting
- Standard Operating Procedures (SOPs)
- Electronic Work Instructions
- QA Lab sampling
  
- **Discussion: Can you think of others..?**

# Water Distribution – Main Break Workflow



# Discussion - ISSUE MAPPING – Workflow

## Value Propositions

**ENFORCE STANDARD PROCEDURES**

**PREDICTIVE RESPONSE**

**WORKFORCE ACCOUNTABILITY**

## Top Concerns

**BUSINESS FACTORS**

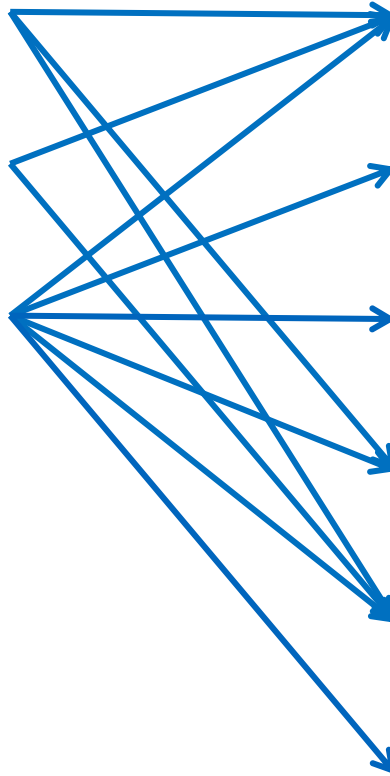
**REGULATORY**

**SOURCE WATER**

**INFRASTRUCTURE**

**WORKFORCE**

**SECURITY**



***Beyond SCADA in practice...***

***Pump Station Intrusion***

***Workflow + IntelTrac***

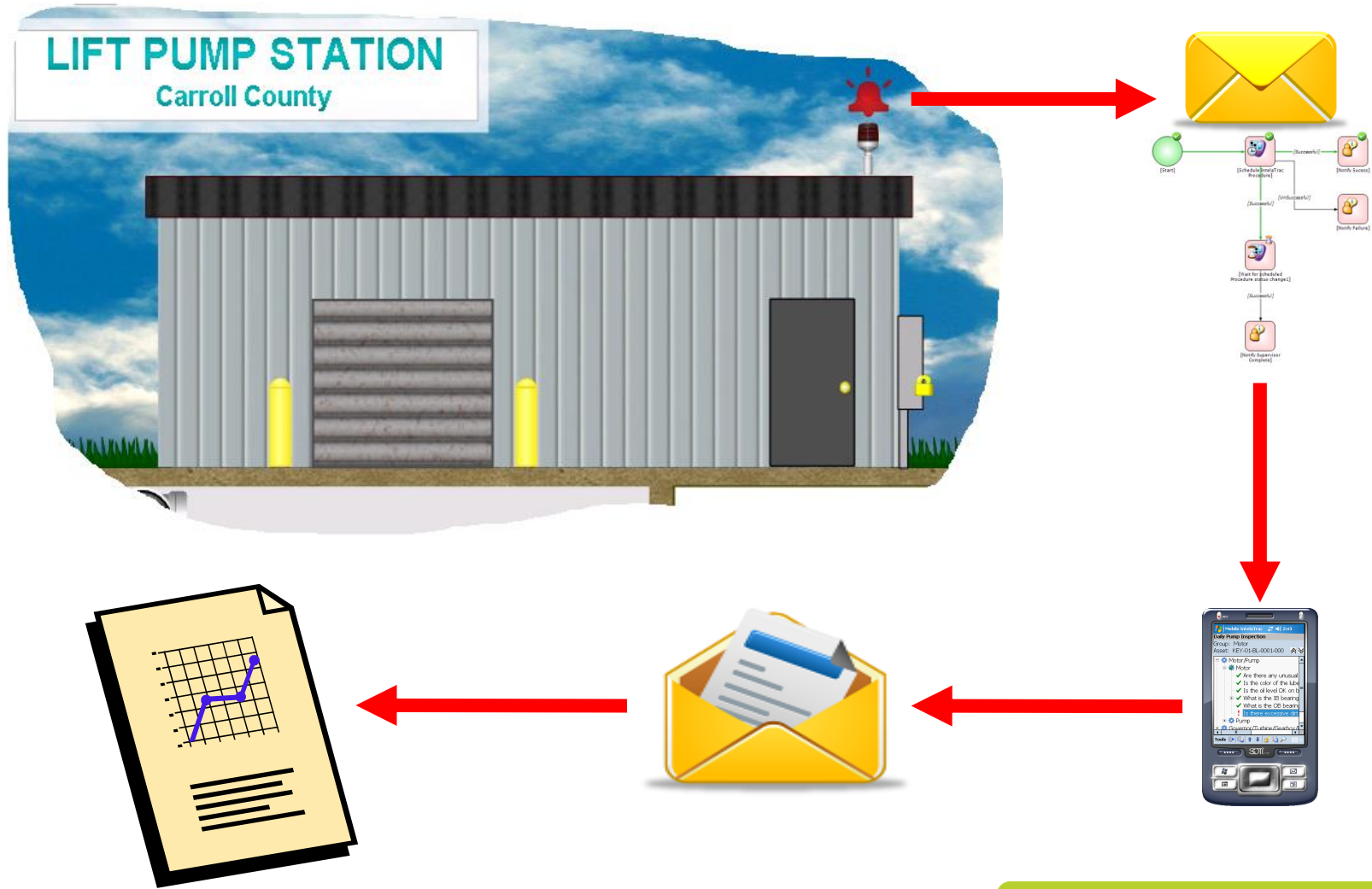




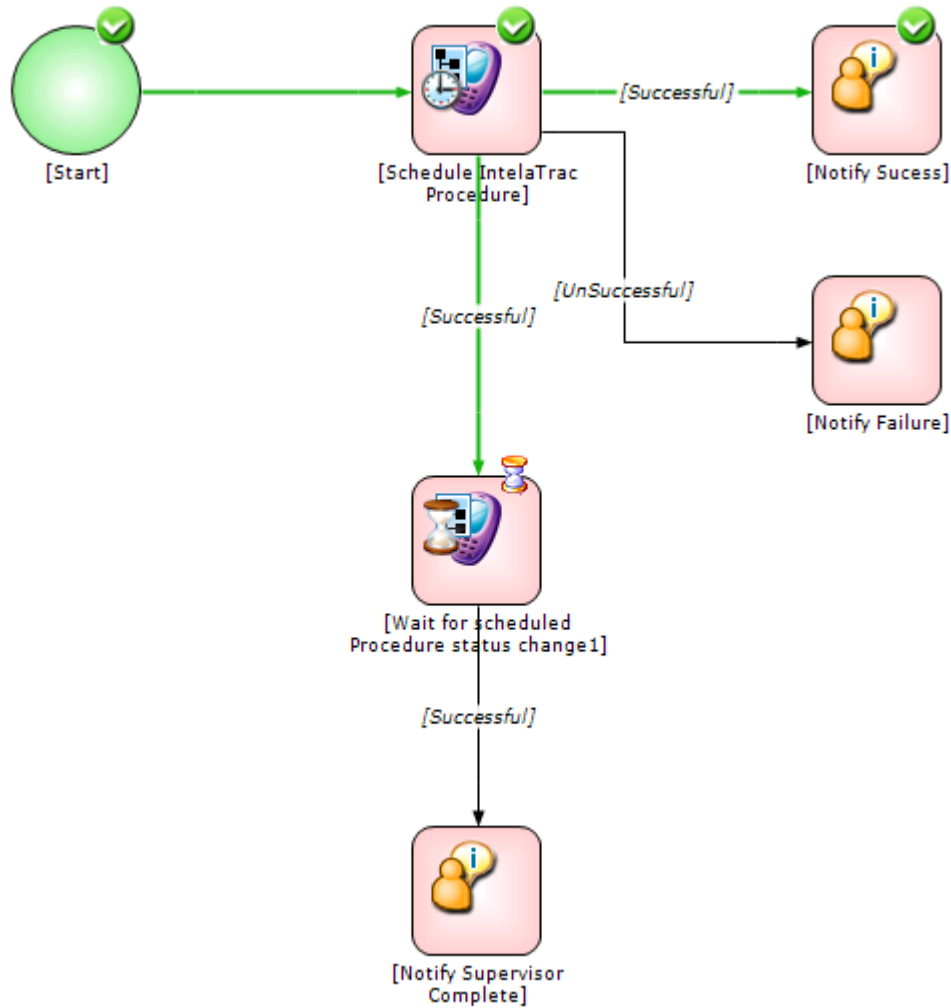
# The Normal View, just another day... SCADA

The screenshot displays the Wonderware WonderWater Works SCADA interface. At the top left is the Wonderware logo with 'invensys' above it. The main title 'WonderWater Works' is centered at the top. A digital clock in the top right corner shows the time as approximately 10:10. On the left side, a tree view shows the following hierarchy: LiftStations, LiftStation\_001 (selected), WaterPlant, SystemArea, and ThinView Displays. The main display area shows a 3D cutaway view of a lift pump station. The top part of the view is a photograph of a grey metal building with a dark roof, two yellow vertical pipes, and a door. Below the building, a cutaway shows the internal machinery, including two pumps connected to a network of pipes. A large tank filled with blue water is visible on the right side of the cutaway. A 'Refresh +' button is located at the bottom left of the main view area.

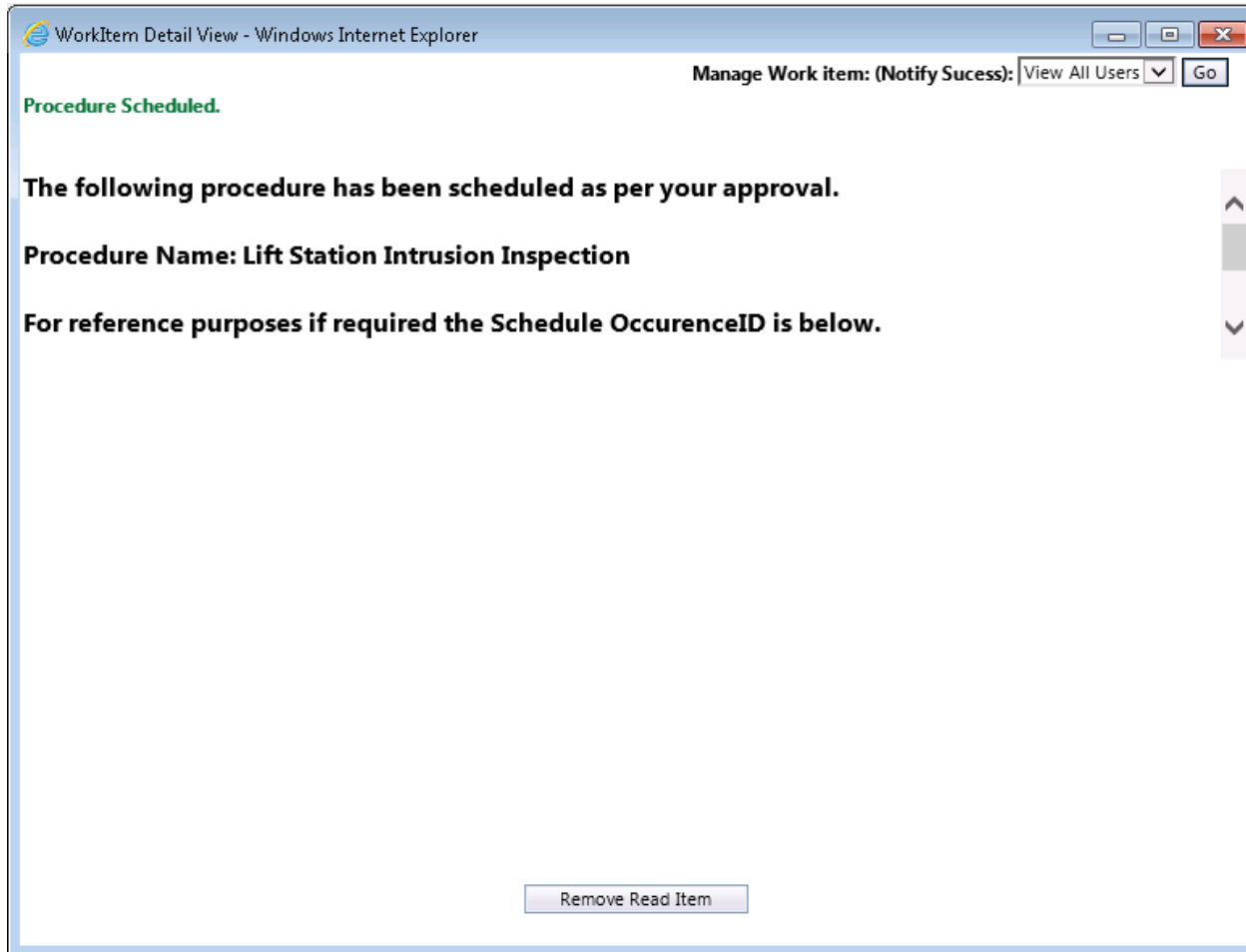
# Intrusion at the Pump Station... Beyond SCADA



# The Procedure... A dynamic standard



# What the Supervisor Gets...



The screenshot shows a web browser window titled "WorkItem Detail View - Windows Internet Explorer". The page content includes a "Manage Work item: (Notify Success):" section with a dropdown menu set to "View All Users" and a "Go" button. Below this, the text "Procedure Scheduled." is displayed in green. The main message states: "The following procedure has been scheduled as per your approval." followed by "Procedure Name: Lift Station Intrusion Inspection" and "For reference purposes if required the Schedule OccurrenceID is below." A "Remove Read Item" button is located at the bottom center of the page.

WorkItem Detail View - Windows Internet Explorer

Manage Work item: (Notify Success): View All Users Go

**Procedure Scheduled.**

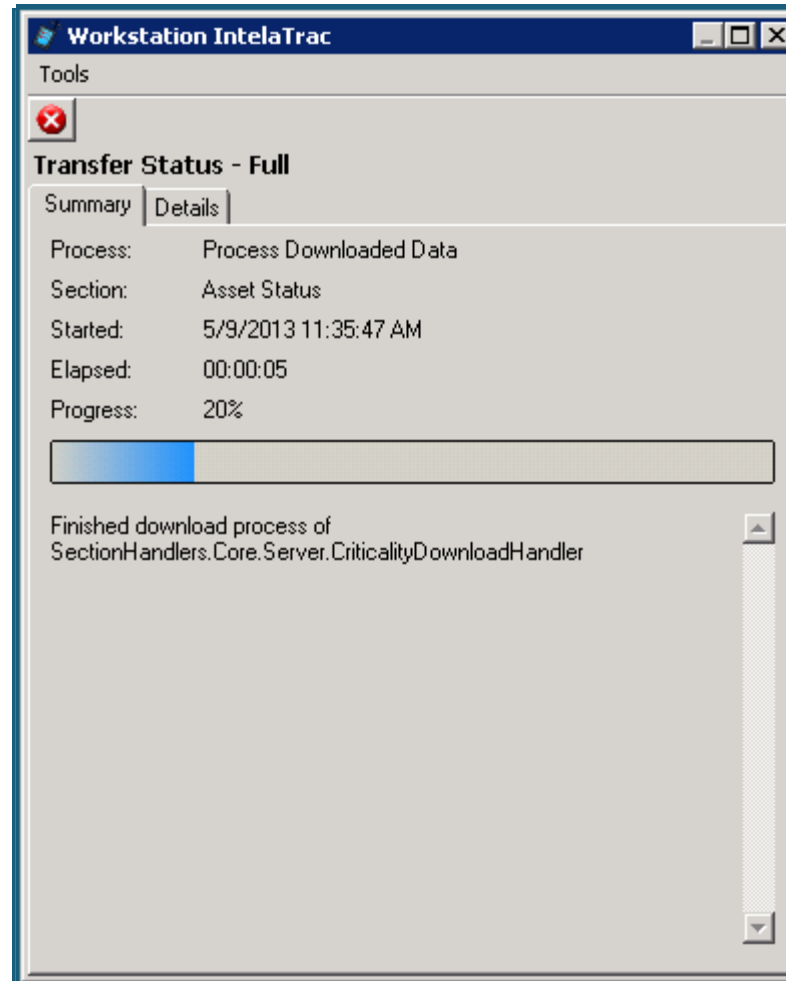
**The following procedure has been scheduled as per your approval.**

**Procedure Name: Lift Station Intrusion Inspection**

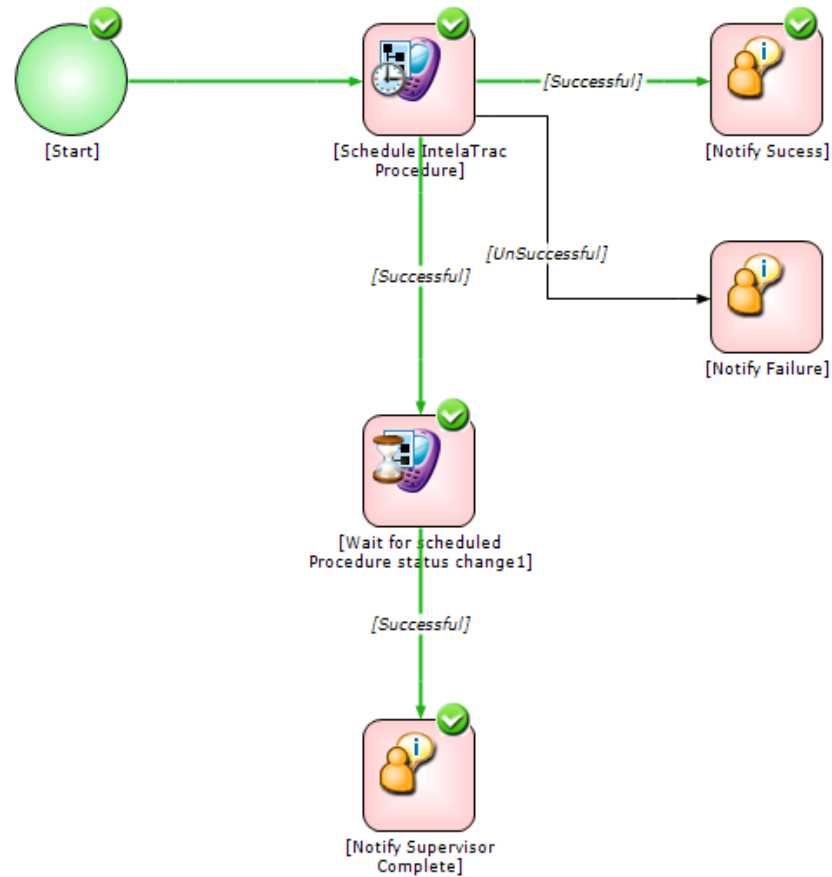
**For reference purposes if required the Schedule OccurrenceID is below.**

Remove Read Item

# What the Operator Gets, plus The Handheld...



# Procedure Complete...





# Now Back to the Supervisor...

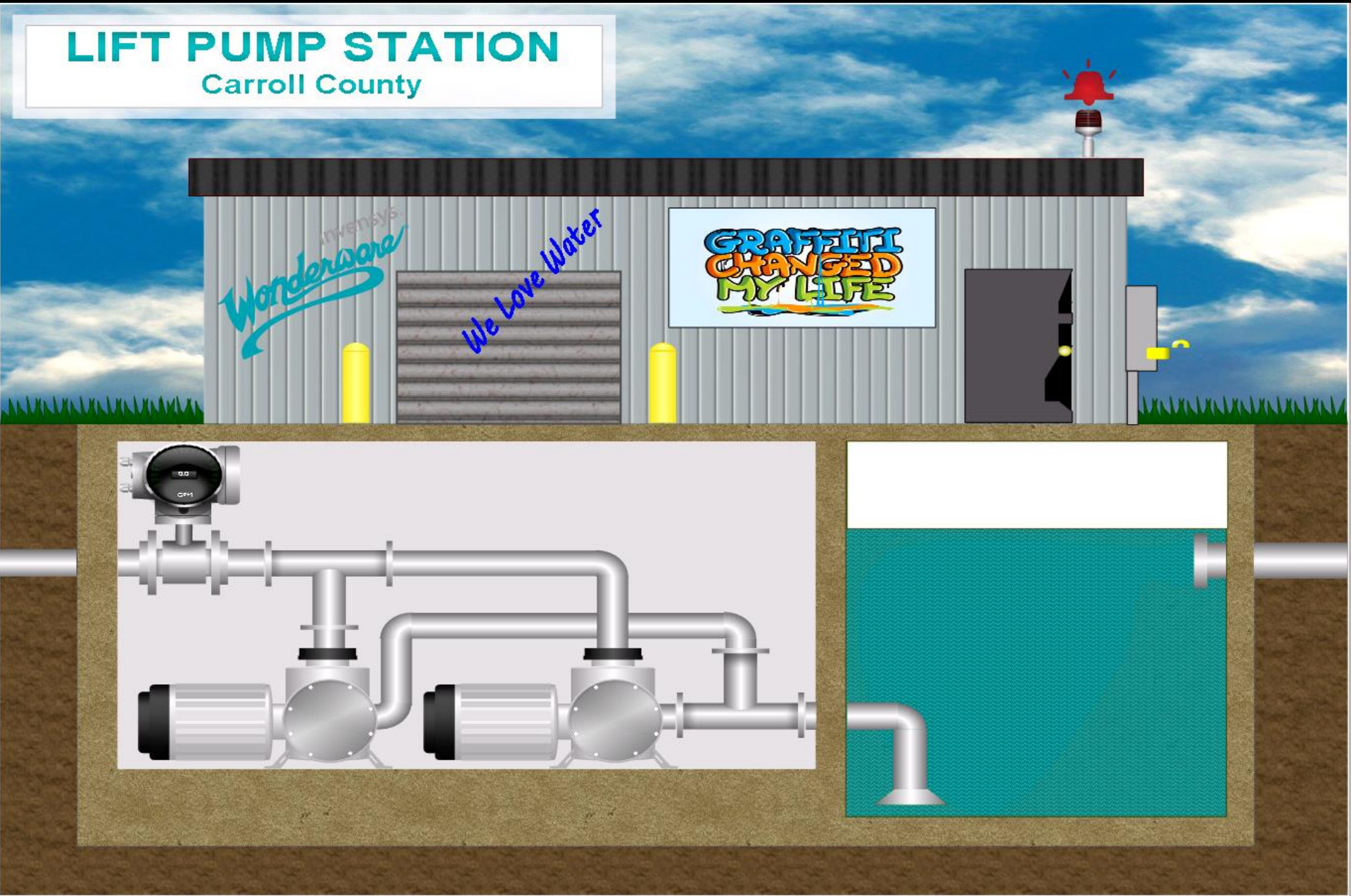
The screenshot shows a web browser window displaying the IntelTrac Web Reports interface. The browser address bar shows the URL `http://inteltrac-demo/IntelTracWebReport`. The page features the Wonderware logo and the text "Software Solutions for Real-Time Success<sup>SM</sup>". Below the logo, there is a navigation bar with "Reports", "Scheduling Engine", and "Logout" options. The main content area displays search filters: "Select Bases: Water", "Date/Time Range: Min Date: 5/8/2013, Min Time: 12:00 AM, Max Date: 5/9/2013, Max Time: 11:59 PM", "Date Ran: 5/9/2013 11:16:13 AM", "Criticalities: Visual Inspection", and "Severities: Alert". There are also links for "Revise Search Criteria", "Export to Excel", and "Cache Full Report". A table with 7 columns is shown, with a header row and one data row visible. The table has a group-by instruction above it.

1  
Drag a column header here to group by that column.

Base	Procedure	Group	Task	Value	Asset	Asset Description
Water	Lift Station Intrusion Inspection	Exterior Inspection	Check for Graffiti	Yes		

# LIFT PUMP STATION

Carroll County



# The Procedure...

The screenshot displays the Wonderware Procedure Builder interface. On the left is a 'Toolbox' containing various procedure items categorized into:

- Procedure Items:** Task Group, Decision, Task, Condition.
- Actions:** Force Calculation, Jump, Message, Note, Launch Procedure, Work Order Request.
- Integrations:** Production Data, IP21, OSI, PHD, Wonderware Historian, Wonderware Galaxy, IntelTrac Tag.
- Peripherals:** RFID, RailCar, VIBTOOL, Barcode, SKF® CMVL3600-IS M, Cyclops 100 / 390 Ten, Raynger MX4 Series T.

The main workspace shows a procedure titled 'Lift Station Intrusion Inspection'. The workflow is as follows:

- Exterior Inspection** (Task Group)
  - Check for Graffiti** (Condition)
    - Graffiti Present** (Action)
    - Graffiti NOT Present** (Action)
  - Check Door** (Condition)
    - Door Secure** (Action)
      - Hidden Task** (Condition)
        - Write a True** (Action)
    - Door NOT Secure** (Action)
      - Notify Police** (Action)
      - Hidden Task** (Condition)
        - Write a False** (Action)
  - Check Utility Box** (Condition)

At the bottom of the workspace, there is a 'Procedure Revision' section.

***WATER***

# Water - the Precious Resource



*For life*



*For agriculture*

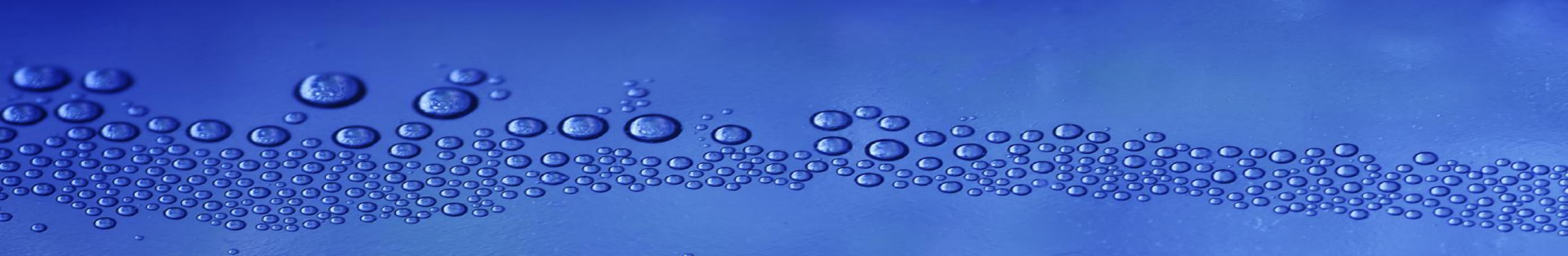


*For progress*



*For economy*





## *The mission of the Water and Wastewater Industry:*

to provide a reliable service  
at affordable rates  
that delivers high quality water<sup>1</sup>  
in a sustainable<sup>2</sup> environment

RELIABILITY

COST EFFICIENCY

COMPLIANCE

SUSTAINABILITY





# The water you are drinking, has been drank before...



hundreds, if not thousands of times before...

# The difference between Good and Great...

SCADA Solution that helps solve Operations issues...

98.93% Good (3.8 sigma)

- 66,807 defects / million opportunities
- 20K lost articles of mail / hour
- 5K incorrect surgeries / week
- 2 short/long landings /day
- 200K wrong drug prescriptions / year
- No electricity for 7 hours / month
- **Unsafe drinking water 15 min / day**

“Beyond SCADA” Solution that helps solve Industry AND Operations issues...

99.99966% Great (6 sigma)

- 3.4 defects / million opportunities
- 7 lost Articles of mail / hour
- 1.7 incorrect operations / week
- 1 short/long landing every 5 years
- 68 wrong prescriptions / year
- 1 hour w/o power every 34 years
- **One unsafe minute every 6 months**

# Understand the issues, Map to Technology...

## Value Propositions

**REDUCED MAINTENANCE/  
ENERGY COSTS**

**WORKFORCE EFFICIENCY**

**PREDICTIVE & OPTIMIZED  
OPS & MAINT**

**BUSINESS AWARENESS  
DATA**

**WORKFORCE  
ACCOUNTABILITY**

**ENFORCED STANDARDS  
OPS & MAINT**

## Top Concerns

**BUSINESS FACTORS**

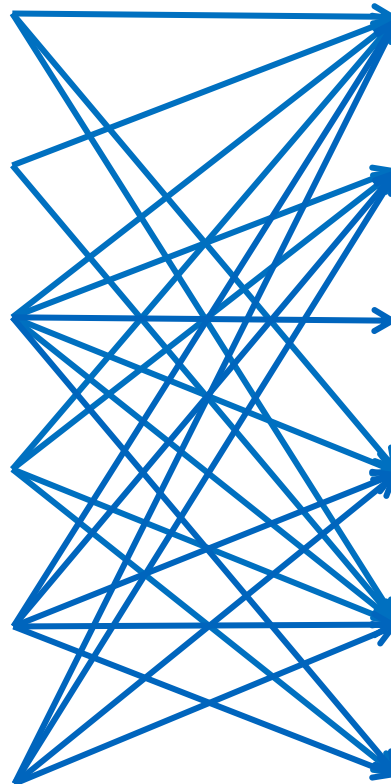
**REGULATORY**

**SOURCE WATER**

**INFRASTRUCTURE**

**WORKFORCE**

**SECURITY**





Security



Cost Reduction



Building Intelligence



Public Utilities Management



Integrated Management of the City



Resources Optimization



Better Services

