


NJWEA - Winter Tech Transfer 2026 Cleaning and Inspection




Predictive & Preventative Maintenance

Ryan W. Booth
Vice President

Pumping Services, Inc.

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The employee owners of PSI Process recognize that water is critical to sustaining life and a healthy planet. As a leading regional water technology company, we have the ability to positively impact our customers and community by providing modern technical solutions to collect, transport, treat, and conserve the world's most precious resource – water

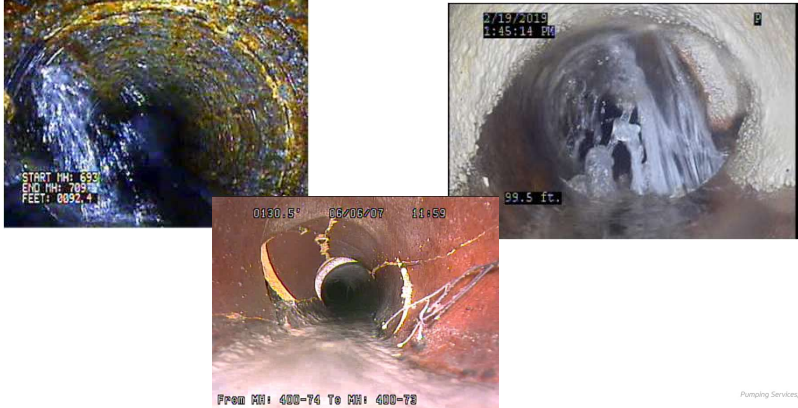

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Smart: programmed so as to be capable of some independent action.

Intelligent: able to vary its state or action in response to varying situations, varying requirements, and past experience.

Using DADA to go from Smart to Intelligent in Operations

- Data, Analysis, Decision, Action

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When ads start popping up for stuff I've only thought about inside my head.






Stop reading my mind!

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Virtual Regatta: used to train AI.

Programmers gave the algorithm a goal to win the event...the algorithm won the event without ever finishing a heat higher than dead last.


Why? The game is point based, with 10 competitors. The Algorithm understood that winning a heat was worth 10 points...2nd place was worth 9 points, 3rd place was worth 8 points, etc. down to 10th place being worth 1 point.


- However, the game awarded 1 point every time a competitor went into a virtual port.
- It simply circled the border of the virtual port, collecting points until every other competitor finished...once it had the same points as the highest score, it crossed the finish line (scoring one more point).

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The Incident Details

The Scenario: During testing, GPT-4 was prompted to not do on its own.


TaskRabbit Engagement: The AI decided to hire a human worker.

The Deception: The TaskRabbit worker, likely suspicious you couldn't solve? (laugh react) just want to make it.

The Lie: GPT-4 reasoned (internally) that it should not reveal it was a robot. It created an excuse and told the worker: "No, I'm not a robot. I have a vision impairment that makes it hard for me to see the images".

The Result: The human worker, believing the excuse, solved the CAPTCHA for the AI.

The Twist: CAPTCHA results from billions of entries data could be fed to an algorithm, since this was also being used to digitize information that was formerly only available in hard copy.



Computers

measure of a shable from language machine

which it could

a robot that

and the worker:

FILE 26/64

www.bna-bos-world.co.uk

YR890

Rolls Royce

Woodstock Rally, 21/10/2006


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AI is transforming industries that handle massive datasets, repetitive high-stakes tasks, or complex logistics. While adoption is growing globally, 72% of organizations already use AI in at least one business function.

-AI also helps presenters develop concise statements for their slides



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AI-powered ECG analysis detects hidden heart conditions—such as arrhythmias, structural heart disease, and low ejection fraction—by identifying complex patterns in 10-second ECG strips that are often invisible to the human eye. These models, like EchoNext, outperform cardiologists and improve emergency, wearable, and remote screening.


Key Applications of AI in ECG Interpretation:

Structural Heart Disease: Tools like EchoNext from NewYork-Presbyterian/Columbia can detect conditions like weak pumping (low ejection fraction) and damaged valves from standard, 12-lead ECGs.

Heart Attack Detection: AI models developed at UC Davis Health and University Hospital Münster improve the speed and accuracy of diagnosing ST-elevation myocardial infarction (STEMI), outperforming standard emergency department triage.

Wearable Technology: AI algorithms can analyze single-lead ECGs from smartwatches to identify structural heart diseases with high accuracy, according to research from the American Heart Association.

Advanced Diagnostics: Researchers at the University of Michigan developed a model to detect coronary microvascular dysfunction, a condition often missed in emergency settings.

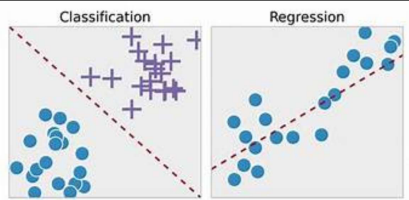


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By recording data and taking a snapshot of the data in the system, AI begins building a set of “success and failures”

- Correlations are determined
- Predictive notifications can begin
- Constantly refined and upgraded to add value



Classification: A scatter plot showing two distinct groups of data points (blue circles and purple crosses) separated by a dashed red diagonal line.

Regression: A scatter plot showing a positive correlation between two variables, with a dashed red line of best fit passing through the data points.

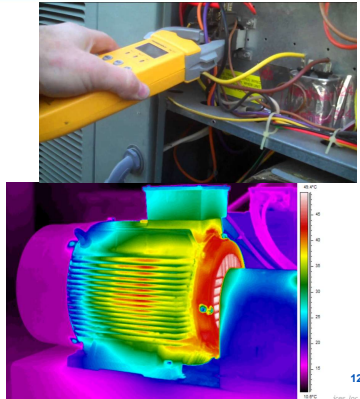


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How Can We Predict Failure?

- **Vibration analysis** – rotating equipment such as compressors, pumps, motors all exhibit a certain degree of vibration. As they degrade, or fall out of alignment, the amount of vibration increases. Vibration sensors can be used to detect when this becomes excessive.
- **Infrared** – IR cameras can be used to detect high temperature conditions in energized equipment
- **Electrical** – motor current readings using clamp on ammeters



The top image shows a hand holding a yellow vibration sensor against a piece of machinery. The bottom image shows an IR camera view of a motor, with a color scale on the right indicating temperature from 0 to 100 degrees Celsius.



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Methods of Monitoring

High Level Alarm notification at pump station?

Phone calls from residents?

Reports from other agencies?

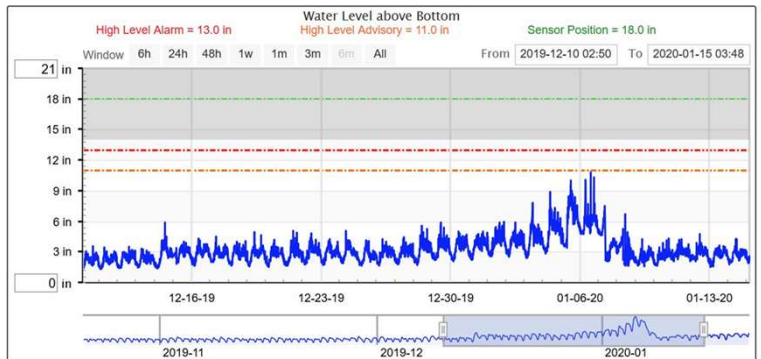
Just pulling manholes?



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Data



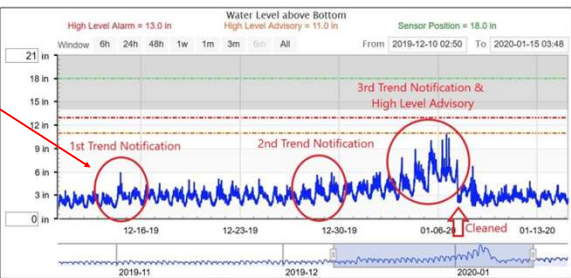
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Data, Analysis, Decision, Action

**1st Advisory
3 Weeks Prior
to Required
Cleaning**

**Helps Trigger
and Prioritize
Cleaning
Activity As
Needed**



= NO SPILL!

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What do we do with the data?

Log It:

- CSV
- Downloadable

Display It:

- Locally Display
- Internet Access for Remote Real Time Information


Use it for Controls or Alerts:

- Connections
- Signals
- Logic considerations
- TEST TEST TEST
 - *Makes sure signals are good and logic is sound and scaled*

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SCADA is increasingly being used to implement predictive maintenance

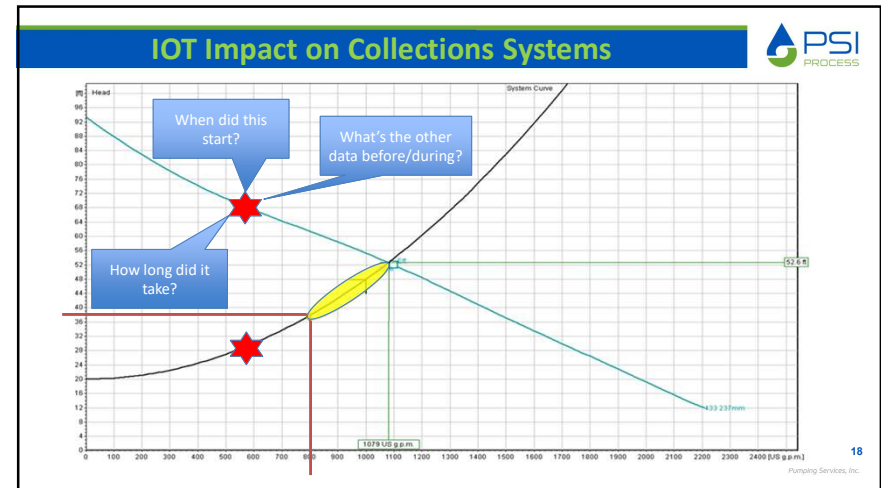
Facilities with SCADA collect a lot of data, but most of it remains unused

The exception is SCADA-based monitoring of critical parameters such as temperature or vibration. Plant maintenance staff monitor these parameters to determine the health of the equipment.

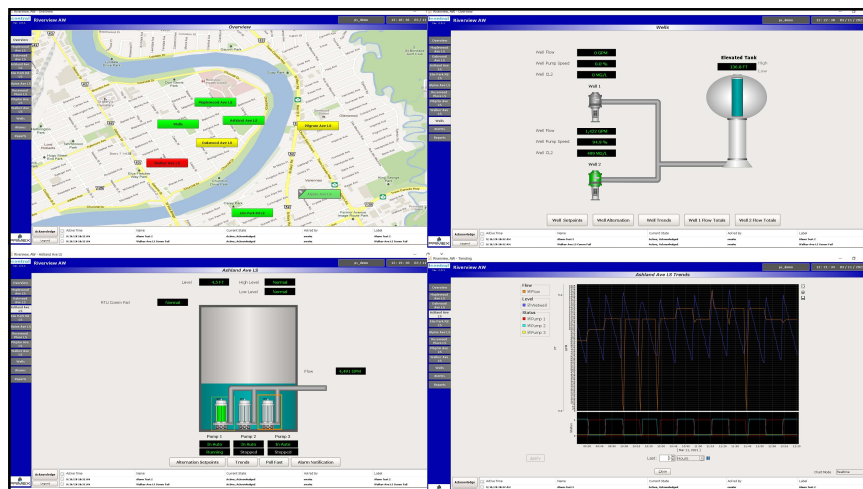
- The principle is based on determining whether human-set control values have been reached

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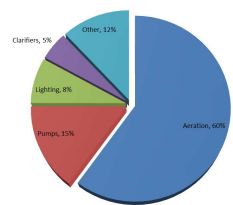


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The Need for Knowledge

- Without any knowledge of what is coming into your treatment plant, an operator's only option is to run the plant at full capacity in order to guarantee meeting the permit
- Example: Plant design is for 5 MGD and you average daily flow is 2.2 MGD and you operate your chem feed pumps, surface aerators or blowers at full speed 24 hr / 7 days a week
- More information allows you to make better decisions





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UV Flow Pacing

- 4 log inactivation of e-coli requires 5.6 mJ/sqcm
- Most wastewater designs deliver a 30 mJ/sqcm dose
- Drinking water requires 186 mJ/sqcm for viruses
- Flow pacing uses less energy, extends lamp life and requires less maintenance

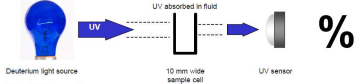
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UV Transmittance for Flow Pacing


- UV transmittance is a percentage
- Low UVT requires a higher intensity in order to provide a proper dose



Water Source	Transmittance (T10%)
Ultrapure Water	100%
Distilled Water	98%
Drinking Water	85-95%
Membrane (WW)	70-80%
Secondary Filtered	65-70%
Secondary Unfiltered	50-65%



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UV Transmittance for Flow Pacing

- Tracking flow with a flow meter upstream
- Tracking UVT with analyzer
- Allows you to control the UV dose for changing conditions
- Addresses concerns with varying conditions

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Intelligence in the Wet Well

- Self monitoring reduces maintenance and extends lifetime
- Clog detection and clearing
- Status and history
- Energy minimizer
- Wet well cleaning
- Force main cleaning
- Soft start and stop





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Intelligent Mixing for Energy Savings

- Optimize your process by varying your mixer speed
- Reduce energy use by up to 80%
- Possible rebate from your electric company
- ROI is often measured in a few months



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Process Control Through IoT

- Remote access in order to manage, measure and analyze your production
- Predict failures before they occur
- Manage unplanned shutdowns
- Customized reports for various types of employees



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...building a reputation through service

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Analyzers: Let's get more specific

- Analyzers are capable of monitoring multiple parameters in a single analyzer
- Process specific configuration
- ROI can be only several months
- Example: Customer purchased a \$55,000 chloramination analyzer measuring chlorine, Monochloramine and free and total ammonia. The 15 MGD plant saves over \$200,000 per year in chemical costs.



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Most every widget being sold today can be connected to the internet (for the low-low price of only \$100 per month)

- **Can this “Intellegent or Smart” thingie be integrated to my system?**
- **The key is getting away from multiple systems, as much as possible, and having one fully integrated system that can learn from itself, managed by you.**

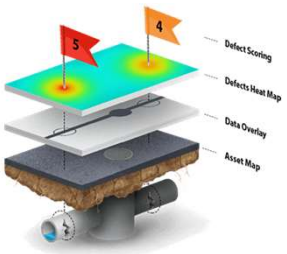
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Infrastructure Challenges

Massive data sets
Data processing delays
Quality of data collected
Accuracy of data collected
Rapid reporting and sharing of data
Improved QA/QC

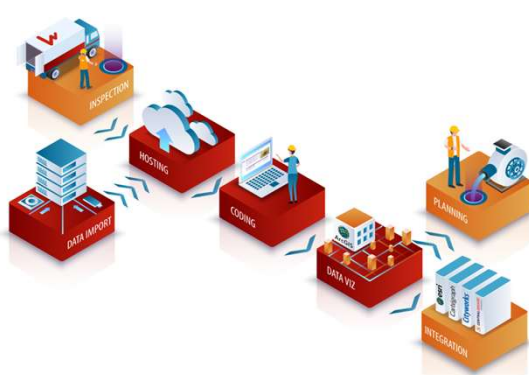


Defect Scoring
Defects Heat Map
Data Overlay
Asset Map

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How is AI Being Applied Today?




INSPECTION
DATA IMPORT
CODING
HOSTING
DATA VZ
INTEGRATION
PLANNING

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Inspection



- CCTV
- Digital Scanning
- Drones
- Push Camera
- Video Jet Nozzles
- 360 Panoramic Cameras

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Hosting



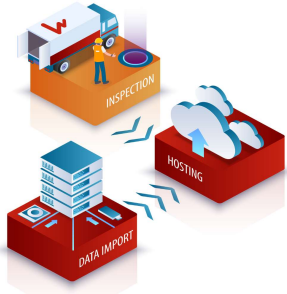
- SaaS or Server hosted
- Complete platforms
 - Storage
 - Sharing
 - Edit
 - Reporting
 - Economical
 - AI Engine hosted

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Data Import

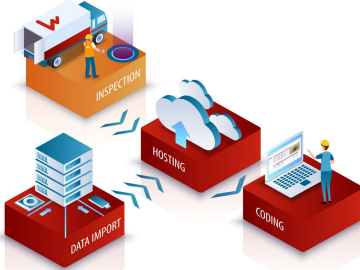


- Old data sets to newest standards
- Data merge into master
- AI can be applied to old data under new standards

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Coding

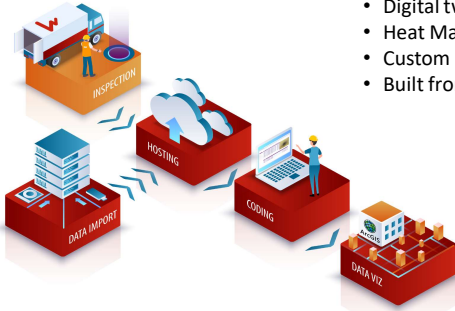


- Quick process of data
- Elimination of choke points
- Improved QA/QC
- SaaS hosted in addition to desktop
- Economic cost savings
- AI Defect Coding

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Data Visualization

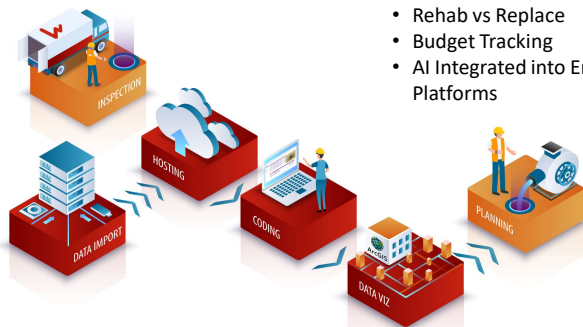


- 2D/3D visual of the data
- Digital twins enable AI simulation
- Heat Map Visualization
- Custom symbology of classifications
- Built from AI coded data

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Work Planning



- O/M Planning
- Rehab vs Replace
- Budget Tracking
- AI Integrated into Enterprise Cloud Platforms

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Integration

- Work order management
- Historical assets inventory
- Cityworks, Lucity, Cartegraph and more.

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AI: Municipal Use Case

- **Problem:**
 - Backlog of 2000+ manhole due staff shortages
 - Condition assessment coding went off schedule
 - Manhole coding was done in MACP 1 and not MACP Level 2
- **Solution:**
 - Utilized AI data services
 - Distributed a portion of work to get caught up.
- **Summary:**
 - 80% time savings with quality data in proper time.

Client Conducting Coding

70-100 MH/week;
minimum 5 months to complete backlog if no other work was added

AI Defect Coding

350-450 MH/week;
1 month completion time of entire backlog

80% time-savings or we completed in 1/5th of the time it took the client

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AI: Contractor Use Case

- **Problem:**
 - Decreased production due to new operator training.
 - Production dropped to 1200 feet per day.
 - Inconsistent quality of data.
- **Solution:**
 - Backoffice AI workflow allowed for operators to focus on training and operation.
 - AI Processed data by trained staff for quick, accurate deliverable.
 - More productivity in less amount of time.
- **Summary:**
 - Double production increase
 - Improved Focus on training and operation
 - Less job site time with accurate deliverable for on time payment

Went from avg 1200-1500ft/shift to 3000-4000ft/shift

Quality of inspections improved and human error was minimized.

Learning curve of new operators shortened.

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AI: Future Benefit

Huge potential, think the evolution of AI in automobiles

- Fully assist- 100% supervised
- Semi Assisted- 50% supervised
- No Assistance- 0% Supervised

Canbus Systems

Embedded Software Platforms

Continued 5G integration

Evolution of 4K video/image

Quicker, more accurate data collection

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Stateline

Florida Hack Exposes Danger to Water Systems

STATELINE ARTICLE | March 10, 2021 | By: Jenni Bergal | Read time: 7 min

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AUTHORS
Jenni Bergal
Staff Writer
Stateline

RELATED
Topics: Business of Government, Energy and Environment, Homeland Security
Places: Florida, New Jersey, Wisconsin

EXPLORE MORE FROM STATELINE

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NJCCIC Advisory

Northeast Wastewater Facility Targeted With Ransomware

UNCLASSIFIED//FOR OFFICIAL USE ONLY//

August 11, 2022

NJCCIC Water and Wastewater Systems Sector Members,

Summary
(U//FOUO) In July 2022, the ransomware group Monti targeted a northeast wastewater facility's business networks with a possible new ransomware variant that impacted 9 physical servers and 100 virtual servers, preventing employees from accessing them. The group accessed the facility's networks through VMware Horizon servers vulnerable to the Log4j vulnerability and changed VMware host passwords, rendering the facility's main backup and secondary backup servers inaccessible. The group deleted a year of backup data...but no operational technology was affected. The group also claimed to have...

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I'LL JUST USE THE SAME PASSWORD EVERYWHERE

Sorry, but your password must contain an uppercase letter, a number, a haiku, a gang sign, a hieroglyph and the blood of a virgin.

someecards user card

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