



Operate With Efficiency & Confidence.

Technology & Asset Management

What's in it for me?

Presenter: Forrest Cooper

www.dudesolutions.com

American Civil Engineer's Report Card

AMERICA'S
G.P.A. **D+**

ESTIMATED INVESTMENT
NEEDED BY 2020: **\$3.6** TRILLION

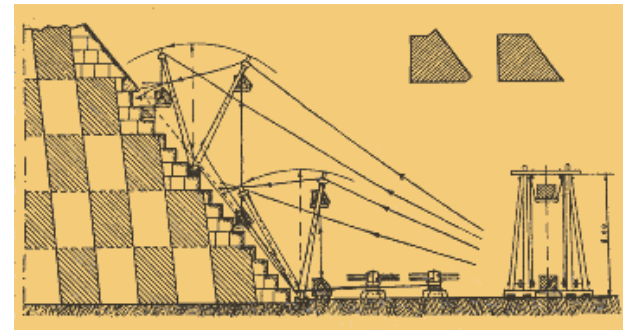
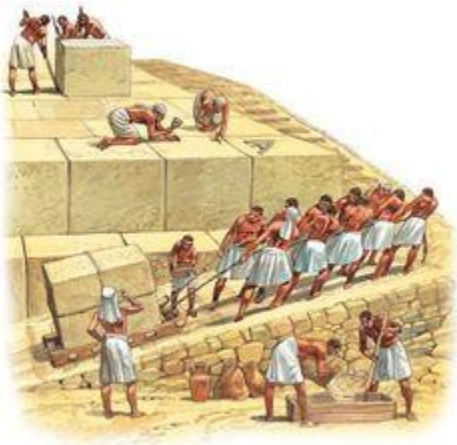
INFRASTRUCTURE GRADES FOR 2013

 ENERGY D+	 SCHOOLS D	 PUBLIC PARKS & RECREATION C-
 TRANSIT D	 ROADS D	 RAIL C+
 PORTS C	 INLAND WATERWAYS D-	 BRIDGES C+
 AVIATION D	 WASTEWATER D	 SOLID WASTE B-
 LEVEES D-	 HAZARDOUS WASTE D	 DRINKING WATER D
 DAMS D		

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Why is Technology Important?

- Throughout time civilizations have created tools to make their jobs easier and accomplish amazing tasks.
- Can technology now give us a “mechanical advantage”?



The Velocity of Technology

- Moore's Law – Computer processing speed doubles every 18 months.
- 80% of the world's population owns a mobile phone.
- 90% of adults have their phone within arms reach at all times.



What is the Internet of Things?

- The Internet of Things is a network of sensors and data collection instruments that are connected to the Internet.
- Data from these devices is collected and streamed directly to the cloud.
- Monitoring temperature, vibration, humidity/moisture etc.
- Specify parameters in your cmms to automatically alert you to issues.
- Result = A new era of 'truly' predictive maintenance

Where do we start?



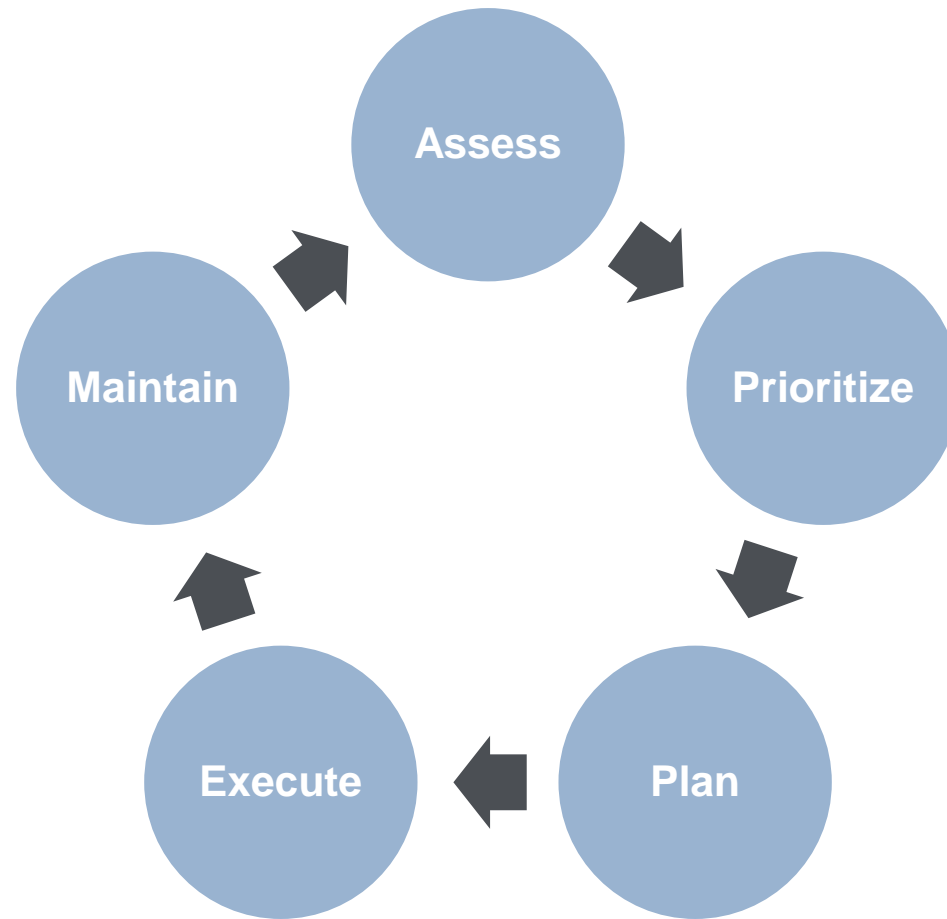
Baseline Defined:

1. A minimum starting point used for comparisons.
2. (in baseball, football, etc.) the line marking the end of the field of play.

How Do We Get a Baseline?

- Condition of our facilities and grounds.
- Inventory, condition, and life expectancy of our assets.
- Risk value associated with losing a system or asset.
- Effectiveness and productivity of our corrective work order process.
- Effectiveness and productivity of our PM process.

What Does Success Look Like?



Assess

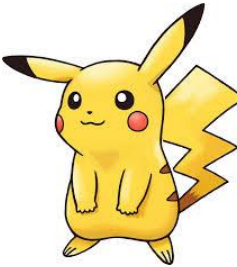
- Gathering a baseline understanding of **Conditions, Needs, Deferred Maintenance, Life Cycle**, and needed staffing resources for RM & PM.
- Is our **Planned Maintenance** program effective?
- Risk Assessment – Are we serious about **Life Safety**?
- Risk Assessment – Are we in a **Run-To-Fail** mentality?

RISK MANAGER



Prioritize

- Based on what we know from assessment.
- Placing a value on needs (Repair vs. Replace, sustainability projects).
- Placing a value on the risk of inaction (Emergency repair costs, workers comp, liability, lost productivity)
- Implementing a scoring system to establish a high-to-low priority for projects.



Plan & Execute

- **Plan**
- **Timeline**
- **Execute** (this is where most begin to struggle)



Maintain!

- The most challenging part of the A.P.P.E.M model, and the point where most long-term plans fail.
- Maintaining RM & PM while balancing capital projects.
- Documentation (aka Data) needed to continually re-assess moving forward.



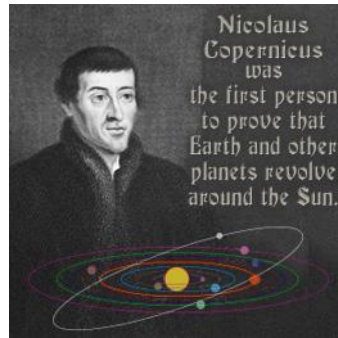
Why Does Maintain Fail?

- Maintain means more than maintenance.
- Capital planning & risk management require **Data**.
- **Data** requires documentation.
- **Documentation** requires accuracy.
- **Accuracy** requires ease of use.



Documentation

- Documentation is not fun...but it is necessary.
- For centuries only few have chosen to document critical data due to complexity.
- Leverage technology to make documentation simple.



What Does Documentation Get Me?

- Data
- Compliance
- Safety
- Risk Mitigation
- Justification of Needs



What Is Data?



I'm Confused....What is Data?

da·ta

/ˈdɑdə, ˈdādə/

noun

facts and statistics collected together for reference or analysis.

synonyms: facts, figures, [statistics](#), details, particulars, specifics; [More](#)

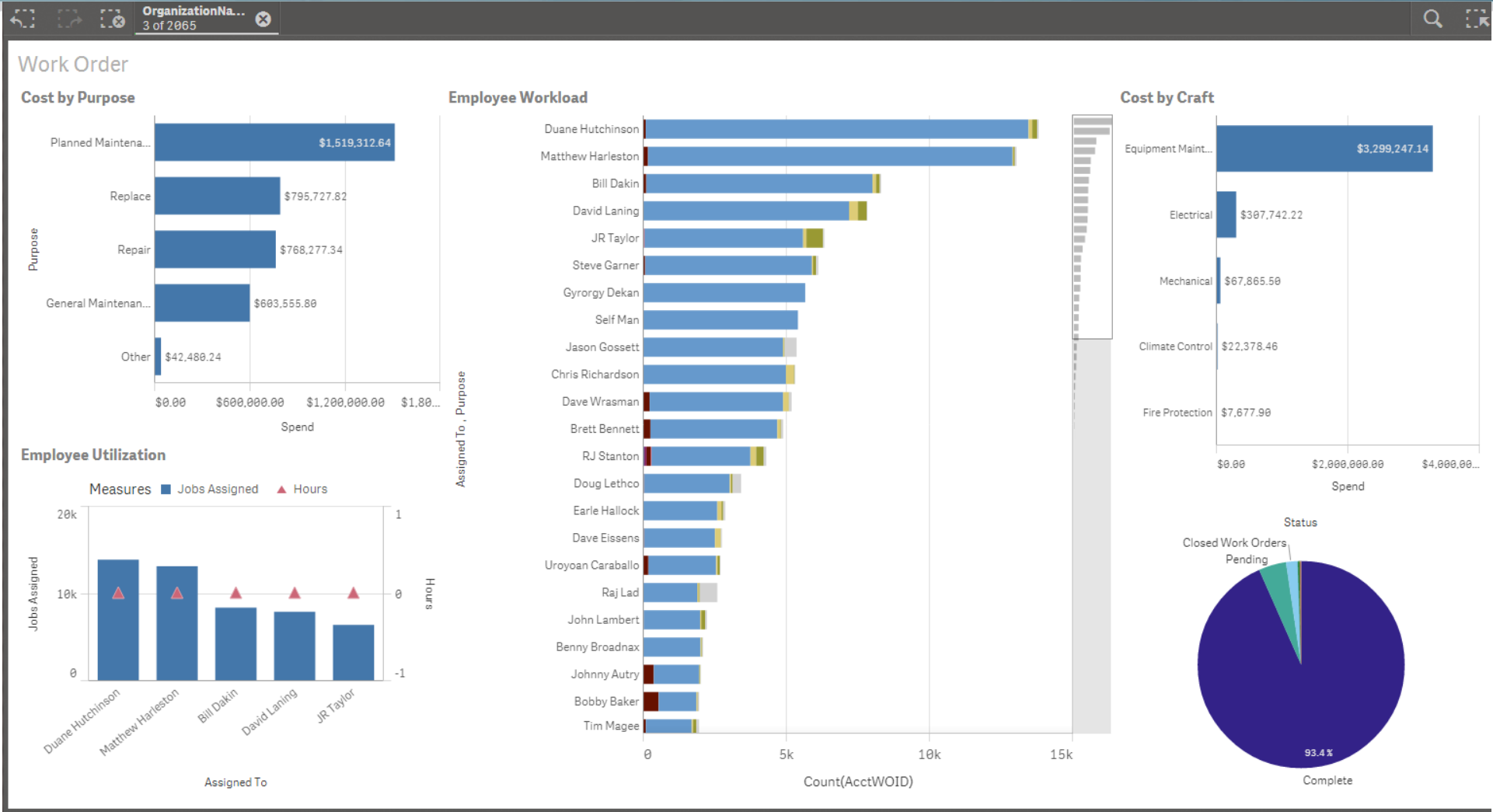
- **COMPUTING**

the quantities, characters, or symbols on which operations are performed by a computer, being stored and transmitted in the form of electrical signals and recorded on magnetic, optical, or mechanical recording media.

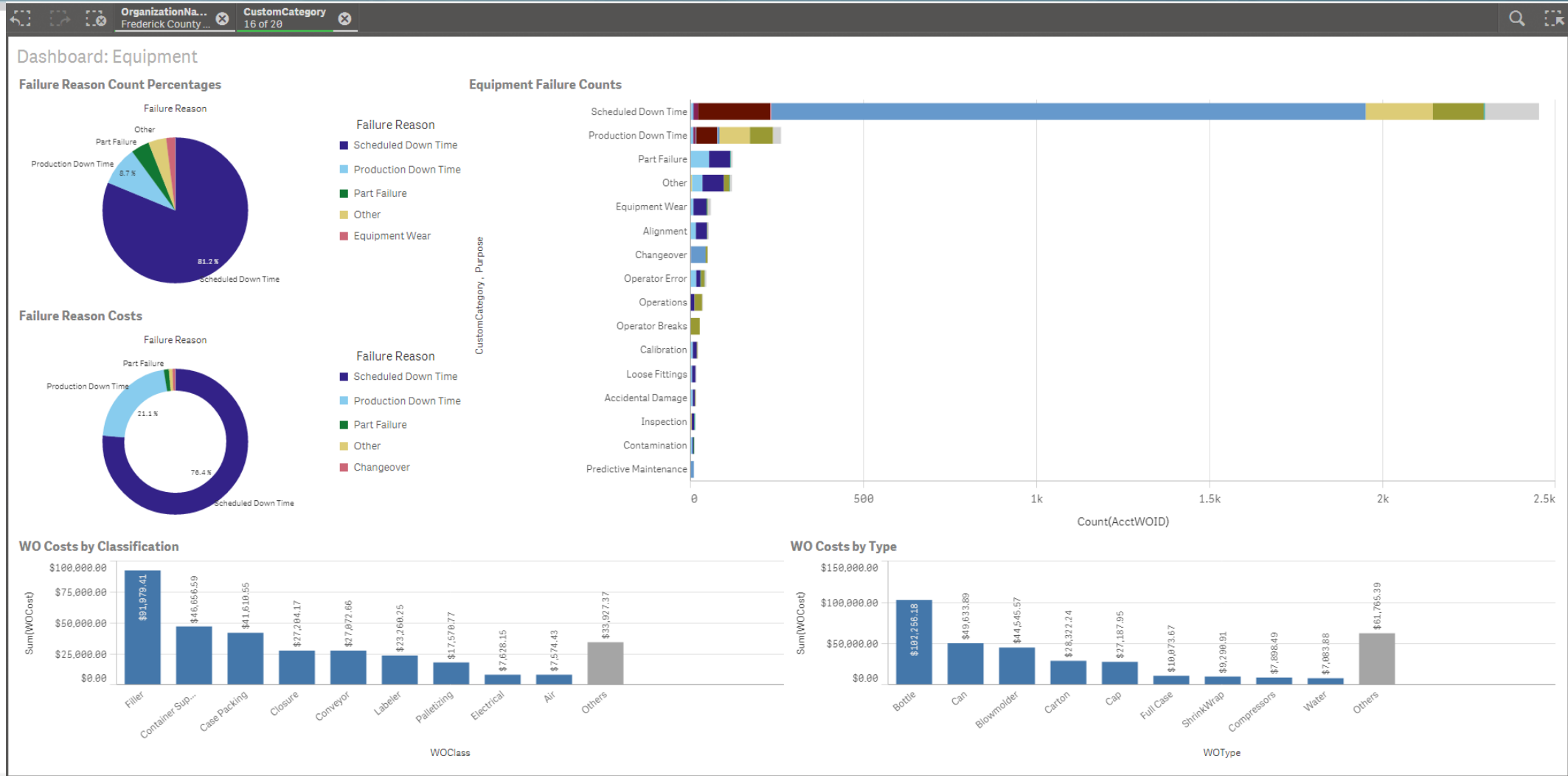
- **PHILOSOPHY**

things known or assumed as facts, making the basis of reasoning or calculation.

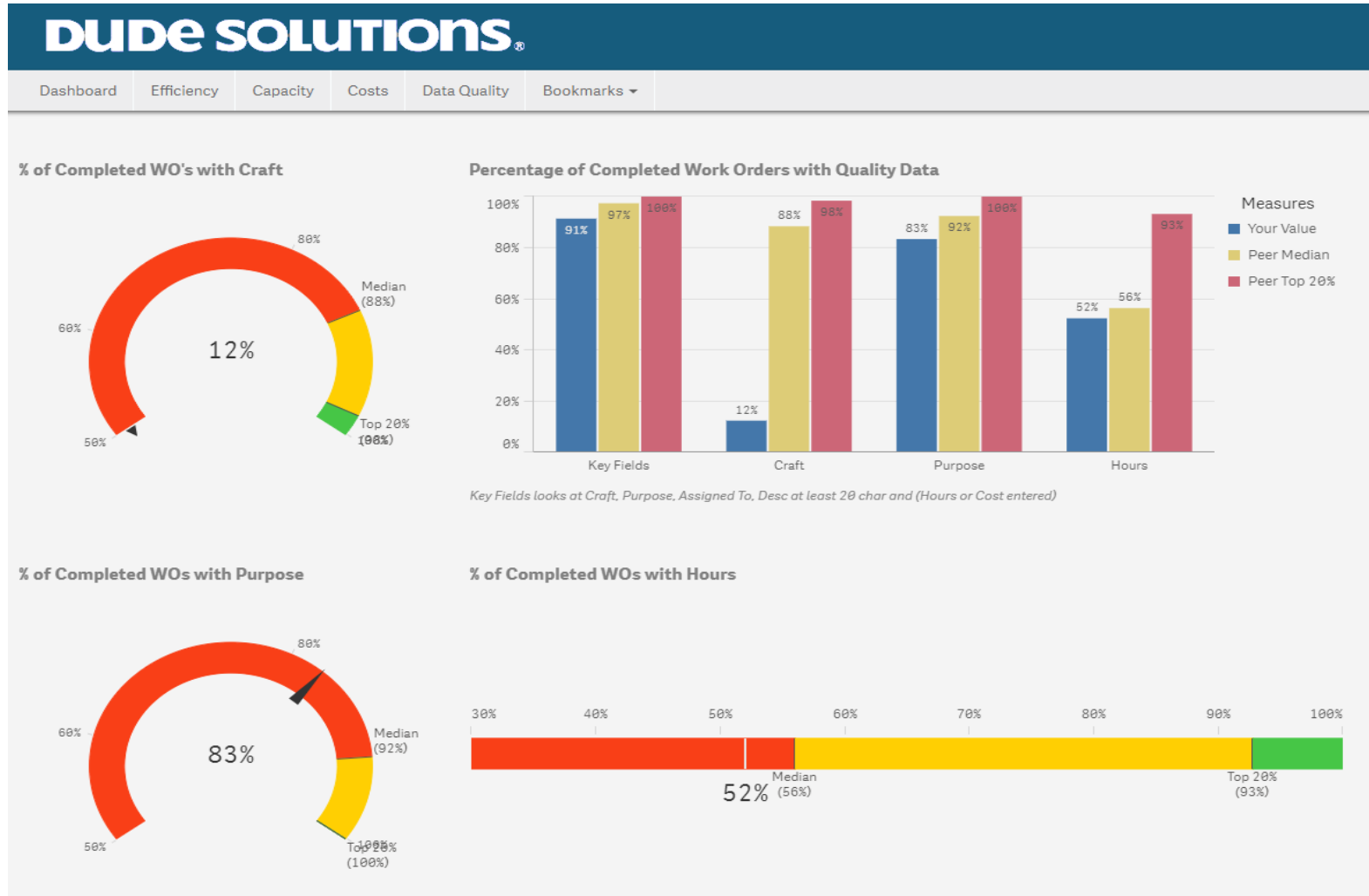
Dashboard: Work Summary



Dashboard: Equipment Stats



Key Performance Indicators (KPIs)



What Does Data Look Like?

Equipment Expenditures Summary

Dudeville

All Dates Selected

Classification: *WASTEWATER

Type: GRINDER

Item Number Description	Maintenance Costs						Preventive Maintenance Costs					
	Labor Hrs	Labor Costs	Material Costs	Sales Tax	Total Costs	% Cost	Labor Hrs	Labor Costs	Material Costs	Sales Tax	Total Costs	% Cost
SG-MM001 Sewage Grinder	0	\$0.00	\$0.00	\$0.00	\$0.00	0%	8	\$189.73	\$0.00	\$0.00	\$189.73	100.00%
GRINDER Totals	0	\$0.00	\$0.00	\$0.00	\$0.00	0%	8	\$189.73	\$0.00	\$0.00	\$189.73	100.00%

Type: PUMP MOTOR

Item Number Description	Maintenance Costs						Preventive Maintenance Costs					
	Labor Hrs	Labor Costs	Material Costs	Sales Tax	Total Costs	% Cost	Labor Hrs	Labor Costs	Material Costs	Sales Tax	Total Costs	% Cost
DWP-546717 DRY WELL RETENTION BASIN FLUSHING PUMP	9.2399	\$248.45	\$72.00	\$0.00	\$320.45	100.00%	0	\$0.00	\$0.00	\$0.00	\$0.00	0%
DWPM-89795 DRY WELL PUMP MOTOR	1	\$25.00	\$50.00	\$0.00	\$75.00	100.00%	0	\$0.00	\$0.00	\$0.00	\$0.00	0%
PM-WEM58489 WEMCO Pump Motor	3.0099	\$84.05	\$15.00	\$0.00	\$99.05	55.71%	2.75	\$78.75	\$0.00	\$0.00	\$78.75	44.29%
PUMP MOTOR Totals	13.249	\$357.50	\$137.00	\$0.00	\$494.50	86.26%	2.75	\$78.75	\$0.00	\$0.00	\$78.75	13.74%

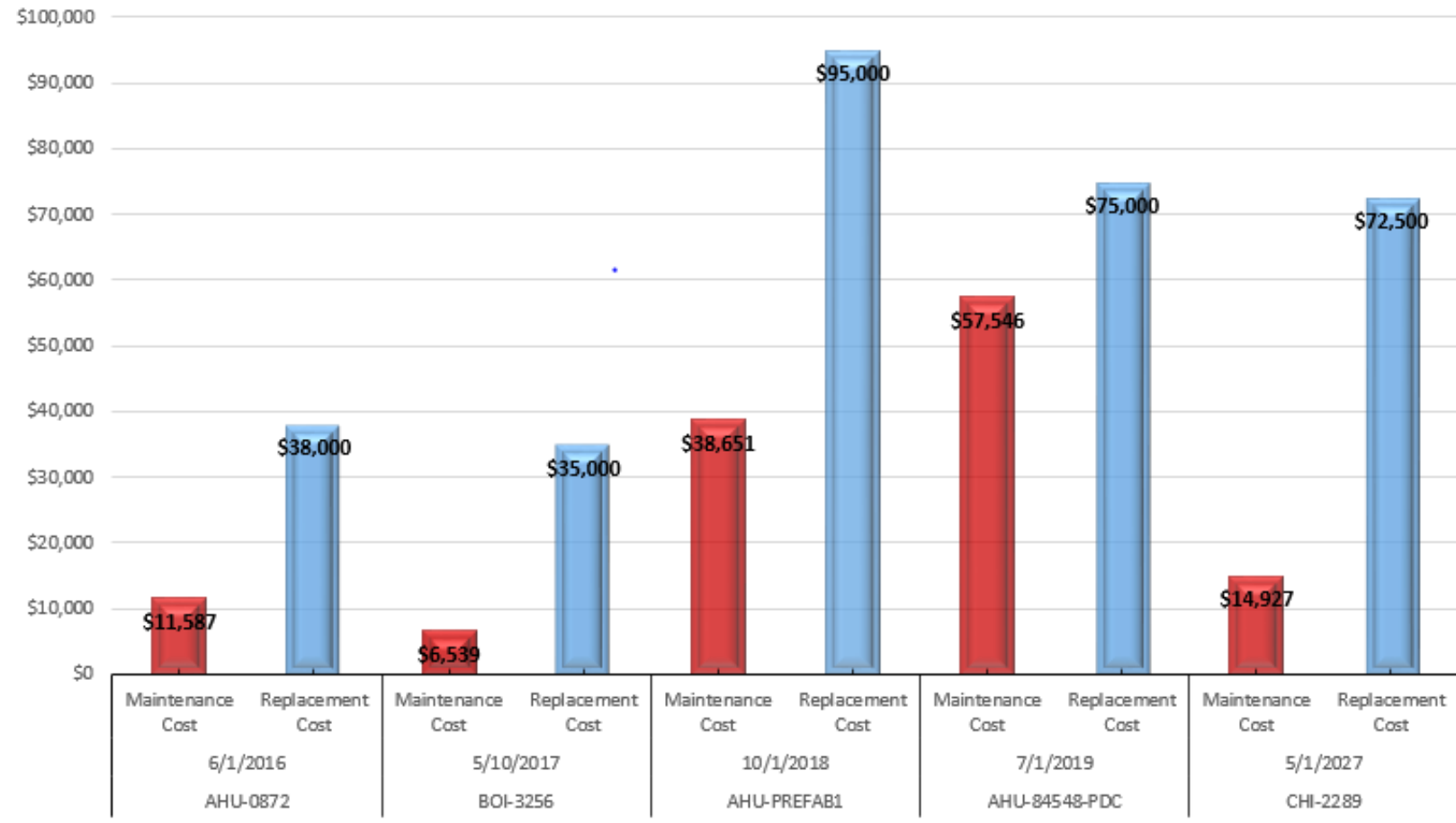
Type: PUMPS

Item Number Description	Maintenance Costs						Preventive Maintenance Costs					
	Labor Hrs	Labor Costs	Material Costs	Sales Tax	Total Costs	% Cost	Labor Hrs	Labor Costs	Material Costs	Sales Tax	Total Costs	% Cost
DWP-235J4 DRY WELL PUMP	0.25	\$4.54	\$48.95	\$0.00	\$53.49	100.00%	0	\$0.00	\$0.00	\$0.00	\$0.00	0%
GP-1354 GRIT PUMP #1	0	\$0.00	\$0.00	\$0.00	\$0.00	0%	0.4199	\$12.60	\$0.00	\$0.00	\$12.60	99.99%



Data Driven Decisions-Equipment

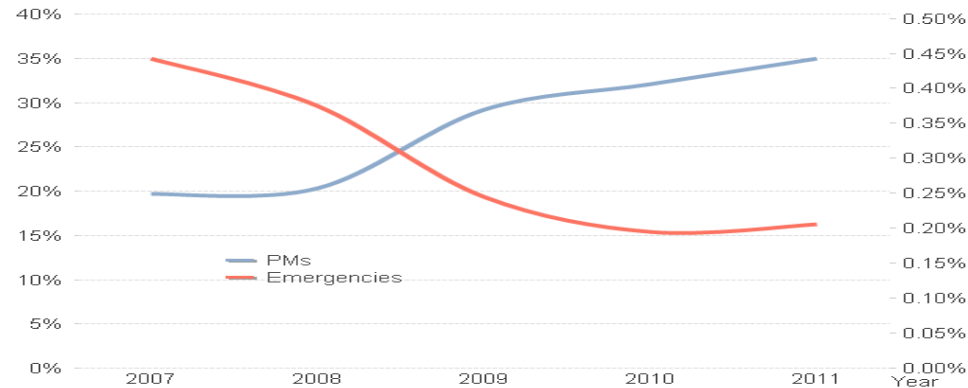
Equipment Repair Vs. Replacement Costs with Estimated Replacement Date



Cost Impact of Consistent Preventative Maintenance

➤ 50% - 65% reduction in the rate of **emergency** work

➤ Lower cost per work order with the average cost per work order being 28.6% to 39.3% less



Rate of Emergency Work

Rate of Emergencies Average for Group	Rate of Emergencies for PM Masters	Reduction in Emergencies PM Master Group
1.89% 1 out of 53 work orders	0.67% 1 out of 147 work orders	64.5% ↓ In emergency work orders

Jones Lang LaSalle PM ROI Study

Developed a Financial Model

Equipment	EUL (Years)	EUL Degradation	PM Cost	RM Cost	Energy Efficiency Degradation	Replacement Cost
Air compressor	20	20%	\$472	\$236	35%	\$4,700/HP
Air handler	20	20%	\$501	\$193	50%	\$1/cfm
Boilers	30	20%	\$691	\$2,121	7%	\$20/MBH
Centrifugal chillers	23	36%	\$5,500	0	23%	\$1,000/ton
Reciprocating chillers	20	36%	\$4,400	0	23%	\$1,000/ton
Cooling towers	20	20%	\$300	0	35%(chiller efficiency)	\$90/ton
Condensers (air cooled)	20	20%	\$204	\$188	30%	\$290/ton
DX units	15	50%	\$200	\$1,600	20%	\$1,200/ton
Early-warning fire detection (EWFD) systems	15	20%	\$534	0	N/A	\$150/detector
Centrifugal pumps	20	20%	\$102	\$891	N/A	\$2,110/hp
Fire pumps	20	20%	\$1,650	\$891	N/A	\$40,000
Switchgear	30	10%	\$27	\$21	N/A	\$11,000
Parking lots	100	90%	\$0.07/sf	0	N/A	\$2.46/sf
Roofs	20	25%	\$0.12/sf	0	N/A	\$10/sf
Weatherproofing	75	50%	\$0.33/sf	0	N/A	\$18/sf

10 Year Old Compressor 25 Year Outlook

7HP Compressor
\$472/yr PM Maintenance
\$944 AVG/Major Failure
\$32,900 Replacement Cost

With a PM Program

- 20 year lifespan
- Repair every 4 years
- \$472/yr in PM work
- Replaced in year 10
- After 25 years = \$50,600

Without a PM Program

- 16 year lifespan
- Repair every 3 years
- \$0/yr in PM work
- Replaced in years 6 and 20
- After 25 years = \$73,650

545% ROI in a PM Program

At the portfolio level, the analysis indicated an NPV of \$2B over a 25-year period for a \$39M/year (\$0.33/sf) PM program. That represents an ROI of 545%. The bulk of the return comes from increasing the useful life of equipment. Energy savings account for approximately 7% of the return.

Accurate projections of replacement and extended asset life
LOWER THE OVERALL COST OF OWNERSHIP

The Good News

- Technology CAN help.
- Deferred maintenance backlogs CAN be shrunk.
- Trust and transparency CAN be achieved.
- Planned Maintenance Works!
- A.P.P.E.M Works!

Capital Planning & Risk Management

With accurate documentation & data, telling the story to justify budget and staffing needs will allow the odds to be in your favor.



Thank You!!





Maintenance

Energy

Facility Usage

Safety

GIS

Technology

MaintenanceEDGE

**Energy
Manager**

**Facility
Schedule**

Safety Center

ConnectGIS

HelpDesk

InventoryEDGE

Mobile311

Insight

Capital Forecast

MDM