

Proactive Job Consolidation for Enhanced O&M Effectiveness

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OWEA S00554-OM 0.75 contact hours



Today's Goals for Learning

- Outline MCWS's job consolidation of mechanics and electricians
- Discuss program's implementation
- Review self-directed training modules
- Review 1-year status
- Review implementation costs
- Answer questions



MCWS Overview

Regional water and sewer provider

11 water booster stations

36 sewer lift stations

3 EQ basins

2 regional WWTPs (Eastern=13 MGD; Western = 20 MGD)

1,118 miles gravity sewers

13 miles force mains

1,347 miles water mains

2009 information--

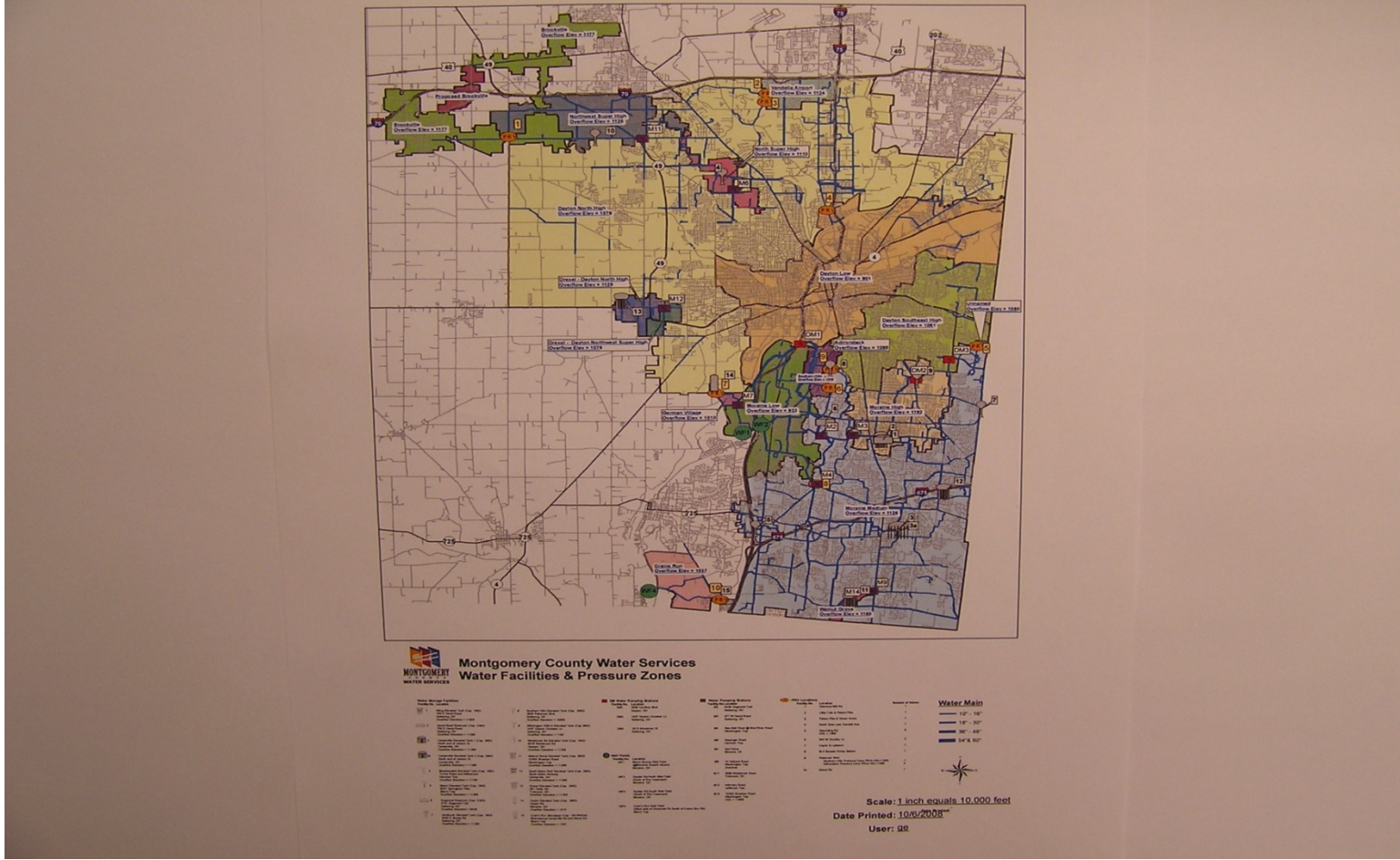
Drinking water purchased from Dayton @26.6 MGD

Eastern @ 7.7 MGD; Western @ 14.1 MGD

Employ 242 persons



MCWS Service Area Facilities



Organizational makeup

8 Service Groups

- Lab Services 9 (drinking water, NPDES and process control)
- Engineering Services 30 (project management; design)
- Maintenance Services 24(vehicles; remote sites)
- Field Services 64(water supply; water/sewer repair; sewer inspect.)
- Water Reclamation 34 (Eastern; Western; MIPP)
- Support Services 55 (billing; HR; meter reading; purchasing)
- Financial Services 16(budgeting; invoice payments)
- IT Services 10(data bases; CMMS; GIS; drafting)



MCWS offices



Eastern Regional WRF



Western Regional WRF

\$3.2M ARRA Funds



Why consolidate jobs?

- Increasing costs
- Improved equipment reliability
- SCADA enhancements
- Aging workforce
- Require one person response
 - remote alarms require mechanic & electrician
- Provide standard training of employees across groups with same basic responsibilities
- Improve knowledge and skills



Mechanics & E&I positions

- Common to Field Maintenance and Water Reclamation
- 14 employees started; 2 new positions in June 2009 (EMT-Entry)
- Need to consider what training; time limits; position classification description; grandfathering; AFSCME input; communications; support



- Review EMT Learner Support slides...

“Trust” was biggest issue...



Electromechanical Maintenance Technician (EMT)

- Current employees retain current job title until EMT criteria met
- New hires = EMT Entry
- Current employees get 4% pay increase during training period
- New hire pay range: \$19.47 to \$23.47/hour
- 3 years to complete all criteria
- Upon completion; get \$1,500 lump payment and move to pay range \$23.19 to 27.96/hour



EMT training criteria (w/i 3 years)

- Complete 14 self-study training modules (and must pass one every 3 months)
- Complete beginning water or wastewater training course (unless already completed OR hold Class I license or greater)
- Complete 500 hours hands-on mechanical and/or electrical work
 - Current mechanic needs 500 electrical hours
 - Current E&I needs 500 mechanical hours
 - New hires need 500 hours each
- Tests scheduled 2 times per month
 - Employee notifies by noon Monday; test at 11:15 Wednesday



TPC Training Systems

- 35 years experience. 35,000 customers. Training for 3.2 million employees
- Provides structured training in skills related to job requirements.
- Subject matter validation. Each answer has a reference number—refers back to specific lesson and paragraph. Self check mini-tests
- Self-study or interactive courses possible
- Contact info: 750 Lake Cook Rd., Buffalo Grove, IL 60089
www.tpctraining.com; email Matina Montes:
mmontes@tpctraining.com



Training Module Titles

- Reading Blueprints
- Reading Schematics & Symbols
- Basic Electricity & Electronics
- Transformers & AC Circuits
- Electrical Safety & Protection
- 3-phase Systems
- AC Control Equipment
- Electrical Troubleshooting
- Basic Mechanics
- Lubricants and Lubrication
- Bearings
- Pumps
- Bearings and Shaft Seals
- Pump Installation and Maintenance

EMT Opt in/out form

MONTGOMERY COUNTY WATER SERVICES (MCWS) SUMMARY OF ELECTROMECHANICAL MAINTENANCE TECHNICIAN PROGRAM REQUIREMENTS

1. There will be two Electromechanical Maintenance Technician job levels. The entry-level will be titled "Electromechanical Maintenance Technician – Entry". The pay range for the entry-level position will be a Pay Grade 49. The upper level will be titled "Electromechanical Maintenance Technician". The pay range for the upper level position will be a Pay Grade 59. All positions in the Maintenance Mechanic or Electrical and Instrumentation Technicians (E&I Tech) series will be abolished through attrition.
2. All Maintenance Mechanics and E&I Technicians are grandfathered in their current position. Participation in the Electromechanical Maintenance Technician Program is voluntary. Any person aspiring to promote into the Electromechanical Maintenance Technician position will have to complete the program as follows:
3. Participants will be required to complete and pass 14 TPC Training Systems courses. All participants will be given a pre-test for the material covered in the 14 TPC Training Systems courses. The pre test will determine if the employee possesses sufficient knowledge in those areas to be given course credit.
4. Participants will be required to complete 1 Operator Training Committee of Ohio (OTCO) Water/Wastewater course. Credit will be given for completion of an OTCO water/wastewater course if the individual currently holds an EPA water or wastewater operator's license
5. Participants will be required to have achieved 500 electrical and 500 mechanical MCWS work hours. Hours obtained will be tracked through the work order system. If an employee is currently an E&I Tech for MCWS, they will receive credit for 500 hours of electrical experience. If an employee is currently a Maintenance Mechanic for MCWS, they will receive credit for 500 hours of maintenance experience.
6. Any employee participating in the program must complete all program requirements within three years of start of program. Additionally, there must be the successful completion and passing of one TPC Training Systems course every three months until all 14 courses are completed.
7. Employee must have a valid State of Ohio Driver's License with an acceptable driving record in accordance with the job classification.
8. All MCWS Maintenance Mechanics and E&I Techs must declare their intention to participate or not participate in the program by designation below no later than December 1, 2008. All employees who are actively participating in the program will receive a 4% plus rating through completion of the program. Once an employee has successfully completed the program, they will be promoted into the position of Electromechanical Maintenance Technician at a Pay Grade 59. Employees who complete the program will also receive a one-time payment of \$1,500 (based on 252 hours of home study time).
9. Failure of an individual participating in the Electromechanical Maintenance Technician program to meet any of the outlined requirements will result in their permanent removal from the program and a return to their previous rate of pay.

Check one option: Opt to participate in program Opt to not participate

Employee Name _____

Date _____

Lesson

3 *Maintaining Centrifugal Pumps*

TOPICS

Installing the Pump	Compensating for Heat	Cavitation
Preparing the Foundation	Installing Auxiliary Pump	Ring Seizure
Fabricated Steel Baseplates	Drives	Overheating
Leveling the Baseplate	Maintaining Centrifugal Pumps	Pump Operation
Checking Shaft Alignment	Inspecting Packing and Seals	Scheduling Maintenance
Grouting the Baseplate	Inspecting Bearings	Troubleshooting
Mounting Pump and Motor Separately	Motor and Drive	
	Avoiding Common Pump Problems	

OBJECTIVES

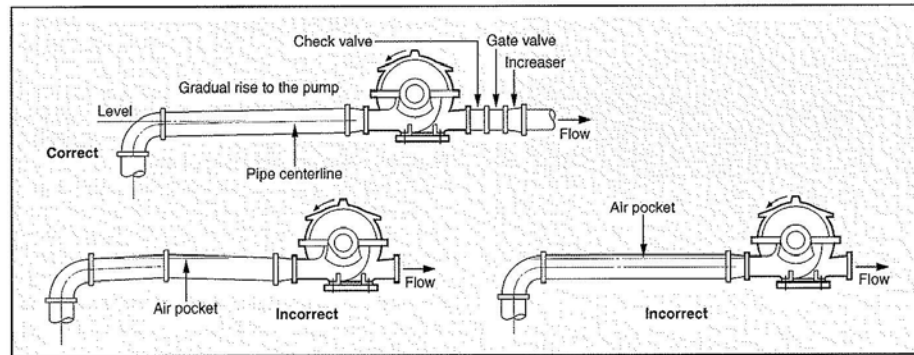
After studying this Lesson, you should be able to...

- Explain how to align and level a pump on its base.
- Explain the needs for and uses of auxiliary pump drives.
- Identify the major symptom of faulty packing.
- Identify the major symptom of cavitation on a pump impeller.

KEY TECHNICAL TERMS

Grout 3.16	a thin mortar or similar material used for filling spaces	Cavitation 3.42	the formation of vacuum cavities in a liquid
End play 3.36	undesirable movement of the pump shaft along its axis	Ring seizure 3.52	loss of clearance between wearing rings

Fig. 3-4. Correct and incorrect alignment



hours. After the grouting mixture has set, retighten the hold-down washers and nuts on the bolts.

Mounting Pump and Motor Separately

3.18 Non-baseplate installations use the steel pad method for mounting the pump and motor separately. This method was described earlier in this Lesson. With the pump and the motor mounting pads assembled as shown in Fig. 3-2, lower the pump onto its pads. The pump shaft coupling half must be in place on the shaft at this time.

3.19 Place a spirit level or a dial indicator on a surface of the pump housing to use as a guide in leveling the pump on its pads. Level the pump across its length

and its width. If necessary, insert shims under the pump feet as required until the unit is level. Install and tighten the hold-down washers and nuts, and check again to be certain the pump is level.

3.20 When you tighten the hold-down fasteners, a certain amount of “spring” will be created in the pump feet. This puts extra loads on the hold-down nuts and should be removed. To remove the spring from the pump feet, place a dial indicator on one foot, as shown in Fig. 3-7 on the following page. Loosen the hold-down nut on that foot and read the amount of movement of the indicator needle. This is the amount of spring in that foot. With the nut loosened, insert that amount of shim under that foot and retighten the nut.

Fig. 3-5. Checking coupling alignment

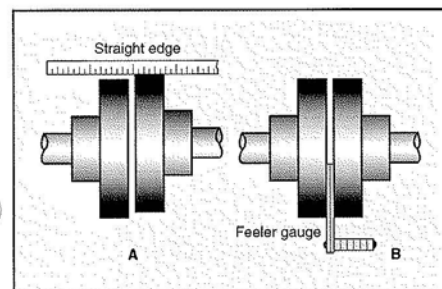
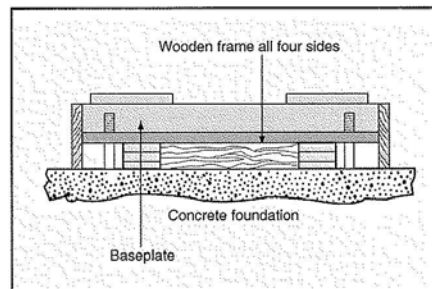


Fig. 3-6. Frame for grouting baseplate



Answer the following questions by marking an "X" in the box next to the best answer.

- 3-1. Angular coupling misalignment can be checked by using a
- a. micrometer
 - b. caliper
 - c. feeler gauge
 - d. plug gauge
- 3-2. The spring in pump or motor feet is measured with a
- a. dial indicator
 - b. micrometer
 - c. steel rule
 - d. feeler gauge
- 3-3. Expansion of turbine or pump parts during operation often causes
- a. cracked housings
 - b. pitted impellers
 - c. misaligned shafts
 - d. worn packing rings
- 3-4. The speed of a prime mover is adjusted to match required pump speed by the installation of a(n)
- a. setscrew
 - b. auxiliary drive
 - c. flexible coupling
 - d. slip clutch
- 3-5. A small amount of seepage from the stuffing box is
- a. a sign that the pump is in need of an overhaul
 - b. a sign of cavitation
 - c. hazardous
 - d. normal
- 3-6. Cavitation is caused by a pressure loss in the
- a. suction line
 - b. discharge line
 - c. auxiliary drive
 - d. turbine
- 3-7. When cavitation occurs, vacuum cavities are created behind the
- a. discharge valve
 - b. suction valve
 - c. line filters
 - d. impeller vanes
- 3-8. In centrifugal pumps, one wearing ring is installed on the pump casing, the other on the
- a. bearings
 - b. impeller
 - c. stuffing box
 - d. packing gland
- 3-9. The most common cause of ring seizure is excessive
- a. pressure
 - b. vibration
 - c. heat
 - d. cold
- 3-10. When you stop a pump, you should first
- a. stop the motor
 - b. close the discharge valve
 - c. close the suction valve
 - d. turn off the auxiliary drive

SUMMARY

Correct pump installation is essential to proper pump operation. Some pump packages arrive completely assembled. Others must be assembled and installed at the job site. In the latter case, a foundation must be prepared, the pump and motor must be mounted, and the shafts must be aligned and coupled.

Before starting up a pump, check pump bearing lubrication. Inspect the adjustment of the packing gland and water inlet valve to the stuffing box. Then prime the pump as specified by the pump

manufacturer. Start the motor and check for proper rotation. Then open the discharge valve and check for liquid flow through the system.

Because of its relatively simple construction, a centrifugal pump is one of the easiest pumps to maintain. Periodic inspection should include pipe alignment, packing and seals, bearings, and drive units. Scheduled inspections and maintenance will pay off in lengthened pump life and fewer breakdowns and emergency repairs.

Answers to Self-Check Quiz

3-1. c. Feeler gauge. Ref: 3.14

3-2. a. Dial indicator. Ref: 3.20

3-3. c. Misaligned shafts. Ref: 3.24

3-4. b. Auxiliary drive. Ref: 3.27

3-5. d. Normal. Ref: 3.33

3-6. a. Suction line. Ref: 3.42

3-7. d. Impeller vanes. Ref: 3.43

3-8. b. Impeller. Ref: 3.48

3-9. c. Heat. Ref: 3.52

3-10. b. Close the discharge valve.
Ref: 3.61

Module tracking sheet

Tim Crago			Pre-Test Scoring			Module Test Scores		
Course #	Course Title	Date Sched/Completed	Raw Score	Total Quest.	Percentage	Raw	Total Quest.	%
EM Pre	Pre-Test	7/22/09						
101	Reading Blueprints		19	20	95.000		50	
102	Reading Schematics and Symbols		16	20	80.000		50	
201	Basic Electricity and Electronics		15	20	75.000		50	
203	Transformers and AC Circuits	11/20/09	9	20	45.000	50.00	50	100.00
205.1	Electrical Safety and Protection	7/29/09	8	12	66.667	29.00	30	96.70
208	Three Phase Systems	12/2/09	11	20	55.000	46.00	50	92.00
209	AC Control Equipment	12/16/09	9	20	45.000	45.00	50	90.00
210	Electrical Troubleshooting	12/23/09	9	20	45.000	42.00	50	84.00
301	Basic Mechanics		14	20	70.000		50	
302	Lubricants and Lubrication	8/12/09	12	20	60.000	44.00	50	88.00
304	Bearings		14	20	70.000		50	
305	Pumps	9/23/09	8	20	40.000	48.00	50	96.00
343	Bearing and Shaft Seal Maintenance	10/7/09	6	10	60.000	22.00	25	88.00
344	Pump Installation and Maintenance		7	10	70.000		25	
OTCO	OTCO Water Distribution I OTCO Wastewater Collection I		157.00	252	62.302			
Work Hours	Hours Worked in Classification							
Total Hours		0.00				Mods Passed	14	

Learning Contract

EMT Learning Contract				
Name		Position		Department:
Current Date	Review Date/Manager	Manager's Signature	Employee's signature	
Development Goal:				
Course/Module		Resources	Test Date	Passed Y or N/Score
Knowledge/Skill Development (500 Hours)		Due Date	Resource	Completion Date # of Hours
Feedback/Support/Progress Tracking				
General Comments/Notes: use other side if needed				

Beginning Training Course

- OTCO Inc., Columbus, OH
- \$560 per course
- Correspondence (or classroom)
- Water supply, water distribution, wastewater treatment, or wastewater collection
- New hires start approx 6 to 9 months post hire
- One employee completed course and passed OEPA exam!!



500 hour hands-on work

- Documented on work orders
- Signed off by Team Leader
- Most work performed while being guided by “expert”
- Hours need to be “balanced” to perform most types of anticipated work as EMT



Worker skills enhanced...

- Goal setting
- Decision making
- Observing, listening and reading
- Improved self confidence
- Achievement and motivation
- Pride in accomplishment
- Operational knowledge



Management Enhancements

- Provides more employees with appropriate level of skills, knowledge and abilities to respond to equipment and system repairs
- Minimizes water and sewer system downtime, failure and operating costs
- Provides standard reference materials to all employees completing the program
- Transfer of Learning
- Creates positive competition
- Create new classification specifications



1 year status

- Of 16 eligible employees, 2 did not sign up (topped-out in pay scale and soon to retire)
- Two employees dropped out in 8/09.
- Two new hires (5/09 and 7/09) as “entry” have completed all modules
- 5 existing employees have completed all criteria (rec’d \$1,500 and receiving higher pay)
- All but two employees have completed all modules
- Remaining are completing OTCO course or needed hands-on hours



1 year....continued

- Tracking overtime
- Comparing 2008 vs. 2009 OT costs
- Tracking repair response time
- How to assign overtime between EMTs and grandfathered personnel?

“Old” system vs. “New” costs

Assume 2 hour call-in after hours

<u>People</u>	<u>\$/hr</u>	<u>hrs</u>	<u>Otx</u>	<u>Total</u>
Mech I	24.27	2.0	1.5	\$72.81
E/I I	24.97	2.0	1.5	<u>\$74.91</u>
				\$147.72

“New” system

EMT	26.00	2.0	1.5	\$78.00
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SAVINGS: \$69.72/event

Program Costs (1st 3 years)

TPC training: 14 x \$874/set = \$12,236

OTCO course: 9 x \$560/unit = \$ 5,040

Bonus Pay: 12 x \$1500 ea. = \$18,000

\$35,276

4% upgrade: Year 1 = \$19,968

Year 2 = \$ 9,984

Year 3 = \$ 3,994

Subt = \$33,946

TOTAL: \$ 69,222

Cost per Year

	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>
TPC Training	\$12,236	\$ 0	\$ 0
OTCO	\$ 4,480	\$ 560	\$ 0
Bonus	\$ 7,500	\$ 7,500	\$ 3,000
4% upgrade	<u>\$19,968</u>	<u>\$ 9,984</u>	<u>\$3,994</u>
TOTAL	\$44,184	\$18,044	\$6,994

Cost Effective?

Assume 1 after-hours call in per week:

\$69.72/event savings x 52 weeks =

\$3,625 saved per year

BUT...

cut risk of injury in half

employer's 14% OPERS fee reduced

other employee can do other work

For 2009 in Field Maintenance, 92% maintenance was planned maintenance (8% "emergency") in hours and costs

Future Decisions??

Since same person can perform consolidated duties, can work load be handled by less bodies as retirements occur?
Has equipment failure and downtime been reduced?
Will enhanced training be necessary?

Questions???