DW Module 11:
Administration
Answer Key

What is an example of the use of a grab sample to cross calibrate a continuous sample?

Ans: One example might be that the continuous chlorine residual analyzer should be calibrated on a regular basis with the manufacturer's calibration standard and a grab sample. By collecting a grab sample, the accuracy and confidence that the continuous analyzer is generating a valid representation of the flow stream can be confirmed.

Does anyone know which reports must be available for public review?

Ans: Sanitary Survey, CCRs, NPDES, meeting minutes in the case of municipalities, budgets, etc.

Unit 1 Exercise

1. List three sample types.

Ans: Raw, Plant Effluent, Entry Point, Distribution, Maximum Residence, Check, or Special

2. List three Sample Methods.

Ans: Grab, Continuous, or Composite

3. (T or F) A Water Allocation Permit is a master plan for any given water service area.

Ans: T

4. List two occurrences that require a Water Supply Permit.

Ans: Construction of new facilities and additions to previously constructed facilities

5. For how many years are Monthly Operating Reports kept?

Ans: 2 years.

6. For how many years are Risk Management Plans kept?

Ans: 5 years.

List three reasons it is important to create and follow SOPs. Indicate the participants should take 2 minutes or less.

Ans: Provides a consistent method to insure that a defined event is always handled similarly. Written SOPs prevent the exclusion of any steps which can occur when a task is not performed frequently.

Is useful in transferring information from senior staff to entry-level individuals. As an employee's experience increases, however, less reliance on the SOP may occur.

May serve as legal documentation.

Class Activity – Developing an SOP

Appendix 9 (page A-75) is a sample SOP addressing the coliform testing procedure.

Chemical usage may exhibit seasonal variations causing a monthly budget to fluctuate. Can you think of some examples?

Ans: Many examples. One might be the use of Powdered Activated Carbon (PAC). Only used in the summer, it is therefore not an expense in the first few months of the year.

CLASS ACTIVITY:

[Instruct the participants to review the Example Budget for a few minutes and to search for items that raise concern.]

Ans: Refer class to Appendix 13 (page A-87) for a thorough analysis of the budget. If nothing is mentioned by class, review only items 1 and 3 from the sample budget with the class.

Appendix 13
Sample Budget Analysis

1. If any category exceeds a change by more than an anticipated percentage change, it must be justified. The first note about T & O problem is an example. Realization that it may be a long term problem should initiate an inquiry to determine possible solutions.

2. The explanation for the changes in chemicals and water analysis appears acceptable.

3. The deviation in fuel oil is not accounted for and should be investigated. It may have been a one time event because the percentage change for the current time period returns to a more normal value.

4. The increase in supplies and expenses is significant. This item should be broken into multiple expense categories since it is approximately 21% of the total plant budget. It is possible that someone is putting expenses into an incorrect budget item. Another possibility is that funds are being used from another account.

5. If the miscellaneous category becomes too large, it must be broken down into smaller items. Do not lump expenses more into miscellaneous than necessary.

6. The electric costs for waste water distribution show a constant increase. It is more than the electric for the main WTP. It should be determined if higher water distribution costs are due to ineffective water booster stations or possible water leaks in mains.

7. Normally, it is not necessary to show pennies in a budget breakdown. Depending upon the intent of the budget, rounding off to the nearest one hundred dollars for proposed budgets is often acceptable.

8. The overall percentage increases are consistent but are greater than typical values for inflation. Determine if income can support this type if increase. Determine cost savings measures.

9. The labor for water collection is showing a declining trend.

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Winter usage is less than summer usage. Can you think of any reasons for this?

[Entertain answers from the class.]

Ans: Summer usage increases due to many outside activities such as swimming pools, car washing, gardening, etc.

In un-metered areas winter usage may increase in cold weather. What could cause this?

[Entertain answers from the class.]

Ans: Winter usage in un-metered areas may increase in cold weather because home dwellers may allow the water to drip to avoid pipe freezing.

Take a minute to calculate the water fire demand in the first problem. Please note that the number 18 in the formula below Table 5-2 is a static factor from National Board of Fire Underwriters.

Ans: Use the formula under Table 5–2 ($F = 18 \times C \times \sqrt{A}$)
Multiply 2 stories x 6000 sq. ft. to get the total square feet of 12,000
Find the C value of ordinary construction in Table 5–2, which is 1.0
$F = 18 \times (1.0 \times \sqrt{12,000})$
F = 18 x 109.5445
F = 1971.801
Round up to next 100 gpm; F = 2,000 gpm

Using the 2,000 gpm answer from the first problem, calculate the total gallons required based on the hour requirement and a town of over 2,500 people.

Ans: At 10 hours duration required by National Board of Insurance Underwriters (NBFU), we start with the 2,000 gpm from the above exercise and multiply that by 60 minutes/hour and then by 10 hours to get 1,200,000 gallons.

Class Activity — Dosage Variation

Calculate the monthly supply for winter operation if dosage is at 2 mg/L to a water production flow of 2.5 mgd.

Ans: We first convert the metric 2 mg/L to pounds by multiplying by 8.34 (conversion factor).
(2mg/L x 8.34 = 16.68 pounds).
Next, we multiply 16.68 x 2.5 mgd = 41.7 pounds per day
Finally, 41.7 pounds/day x 30 days = 1,251 pounds per month

Calculate the monthly supply for summer dosage at 10 mg/L with water production increased to 2.7 mgd.

Ans: Both the dosage and the water production increases.
First we convert the 10 mg/L by multiplying by 8.34 (conversion factor).
(10 mg/L x 8.34 = 83.40)
Next, we multiply 83.40 x 2.7 = 225.2 pounds per day
Finally, 225 pounds/day x 30 days = 6,750 pounds per month

☑ Class Activity – Determine if RMP Is Required

Chlorine usage at the WTP site is 11 pounds per day. Annual shipment is received at one time. Is an RMP required?

Ans: 11 pounds per day x 365 days = 4,015 pounds
Based on the Table for Threshold Planning excerpt, if all chlorine is received at one time, an RMP is required.

The water system consists of a well and intake from surface water. Several miles separate the two locations. Water from the well is conveyed to the WTP before being processed and pumped into the distribution system. Chlorine usage at the well is 4 pounds per day for 365 days per year. The WTP uses 5 pounds per day for 365 days per year. All shipments are in one ton containers. Is an RMP required?

Ans: Well usage (4 lbs/day) x 365 days/year = 1,460 pounds
WTP usage (5 lbs/day) x 365 days/year = 1,825 pounds

The total amount on site is the received 3,285 pounds plus whatever was already there. Total chlorine on site is over 2,500 pounds so an RMP is required.

If the two amounts were delivered to the separate locations, an RMP *may* not be required.

We say "may" because if either of the locations has existing chlorine on site and the amount delivered to those sites make the total chlorine over 2,500 pounds, an RMP would be required.

If only 4 lbs/day is being used, should a smaller feed system be evaluated? Three 150 lb cylinders of chlorine would last 90 days and result in a smaller risk in the event of a leak. Since the 3,285 lbs is above the 2,500 planning level, better management of inventory can avoid the RMP requirement.

Class Activity – Isolation Distance

Table 7-1 taken from the Nation Electrical Code 2002 Handbook shows us sample isolation distance based on voltage to ground and conditions 1, 2, or 3.

If a plant addition includes possible installation of new equipment in a space in a motor control center room, with service of 12,000 volt, what would be the isolation distance under the best conditions (Condition 1)?

Ans: A minimum of 5 feet per Table 7-1.

Class Activity – Cost Justification of New Equipment

[Try the three calculations designed to determine if the purchase of new equipment can be cost justified.]

An old pump, estimated to be only 50% efficient, consumes 5,500 kW/hr/month with a power cost of $ 0.11/kW/hr. Calculate the annual cost of this pump.

Ans: 5,500 kW/hr/month x $ 0.11kW/hr = $605/ month or $7,260/year

A new pump will cost $9,500. It is approximately 78% efficient and will consume 3,500 kW/hr/month with a power cost of $0.11 kW/hr. Calculate the annual cost of this pump.

Ans: 3,500 kw/hr/month x $ 0.11 kW/hr = $385/month or $4,629/year

Calculate how long before the new pump will be paid for by the annual cost savings?

Ans: $7,260 - $4,620 = $2,640 savings per year

$9,500/ $2640 = 3.6 years until new pump is paid off.

Identification of both regular and alternative suppliers for all fuel types at the water system is an important first step toward controlling fuel supplies, costs, and quality. Can you think of some reasons why?

Ans: Many answers including price comparison, fuel delivery schedules, procedures, storage capacity, emergency conditions, etc.

Class Activity – Fuel Consumption of Staggered vs. Non-Staggered Startup of the Emergency Generator

Calculation Examples

A WTP requires 500 hp of motors and 25 kW of lighting and similar loads at maximum operation. During normal operation total use = 145 hp of motors and 25 kW lighting.

Calculate Normal Load.

Ans: 145 hp of motors x 0.75 (conversion factor) = 108.75 kW.
110 kW (rounded) + 25 kW (lighting) = 135 kW normal load

Calculate Maximum Load.

Ans: 500 hp of motors x 0.75 (conversion factor) = 375 kW
375 kW + 25 kW (lighting) = 400 kW maximum load

Option A: Non-Staggered Start Up

Assume the entire connected load is energized at the same time. The in-rush current in motors creates about a 60% surge factor for a few seconds

Calculate what kW load the generator would need to handle.

Ans: First we multiply 375 hp by 60% to determine the surge factor of 225 hp
Then we add 375 hp to 225 hp to get total horsepower
Convert 600 hp to kW with the 0.75 (conversion factor)
600 X 0.74 = 450 kW
Adding the 450 kW to the 25 kW for lighting, our grand total is 475 kW Gen-Set

Calculate a rough estimate on fuel consumption.

Ans: 475 kW x 0.04 gal/hr = 19 gallons/hour

Option B: Staggered Start Up

[Refer to Table 8-1.]

Let's look at Row 1 Column 1. It represents the 400 kW load (375 = motor, 25 = lighting) that *could* be connected. With a staggered start up only a portion will be initially connected.

Row 1 Column 2 represents 145 kW (120 = motor, 25 = lighting) to be initially connected.

Row 1 Column 3 represents the 120 kW plus 60% rush factor plus 25kW of lighting connected. A total of 217 kW.

Row 1 Column 4 represents the load on the generator after the 60% in rush is satisfied.

Row 2 Column 2 represents the remaining potential load to be connected.

And so on.

Would a critical parameter be more efficiently controlled by the feedback method? Why?

Ans: Feedback control is preferable to prevent unacceptable results continuing for a prolonged period. If preprogrammed correctly, a SCADA will take necessary action to correct detected problems.

In what other ways could a SCADA be important to fire support?

Ans: Many answers are possible. For example:

Monitor the level in a water tower.

Inform the operator of a major water demand.

Activate pumps to satisfy water demand.