

What do I need to know to pass an Advanced Industrial Wastewater License Test?

[Activated sludge, metals finishing, sedimentation/clarification with chemicals, DAF]

All of the Basic Industrial Wastewater NTK plus the following:

Industrial Waste Treatment Volume 1 (Third Edition)

Regulations Chapter 3

Pretreatment standards and regulations – 3.2 – 3.3

- What is the purpose of the General Pretreatment Regulations?
- Pretreatment regulations regulate pollutants that may do what?
- What are the conventional pollutants?
- Who is required to develop a pretreatment program?
- Define “significant industrial user”.
- What is a “baseline monitoring report” and what is required in it?
- Describe general and specific prohibitions.
- What are toxic pollutants?
- Describe BPT and BAT.
- What are the two main different types of categorical standards?
- What information is required in a periodic compliance report?

RCRA – 3.5

- What are RCRA’s primary goals?
- What are some of RCRA’s exemptions?

Clean Water Act – 3.55

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- What stormwater discharges require permitting under the NPDES?

Industrial Monitoring Chapter 5

- Confined Space

Flow Measurement Chapter 6

Hydraulic and instrument calibration – 6.5 – 6.51

- What are the basic methods for checking the accuracy of flow metering?

Flows to measure – 6.6

Flow proportioned samples – 6.7

- When should composite samples be obtained?
- Describe flow-proportioned composite sampling.

Preliminary Treatment Chapter 7

Flow equalization tanks: types, mixing, and shapes-Lesson 1, 7.2

- What are the two purposes of mixing?
- Define “short-circuiting”.
- Describe some of the advantages/disadvantages of the different shapes of tanks.

Types of screens – Lesson 2, 7.51

- Why is screening used to pretreat industrial wastewater?
- What types of solids can be effectively screened?
- What are coarse screens also called and why are they used?
- How are coarse screens usually cleaned?
- What is the purpose of fine screens?
- Why are static screens popular in industrial wastewater treatment?
- How are static screens cleaned?
- Describe the different types of rotating screens and what types of waste they are best suited to handle.

pH adjustment – Lesson 3, 7.7 – 7.9

- Explain the pH logarithmic scale.
- What is used to bring pH within a general range?
- What is used to “fine tune” pH?
- pH adjustment is also dependent upon what?
- What three elements contribute to a successful pH control strategy?
- Wastewaters may self-neutralize if there is enough what?
- What is the most important part of pH adjustment?
- What could happen if proper pH mixing does not occur?
- What is “dead time”?
- What affects dead time?
- What are the two types of mixing?
- For good intermixing, when should the reagent be added to wastewater?
- Residence time is dependent upon what?

Physical-Chemical Treatment Processes – Chapter 8

Solids removal using chemicals – Lesson 1, 8.1

- What are the three steps in physical-chemical treatment?
- Define coagulation and flocculation.
- How is pinpoint floc formed?
- What is the purpose of flocculation?
- Why is chemical coagulation used?
- Addition of chemicals usually creates more what?

Coagulation/flocculation – 8.2

- What is coagulation?
- Fine suspended solids particles tend to accumulate what?
- Define electrostatic repulsion and coordination sphere formation.
- How is electrostatic charge reduction accomplished?
- Why is the initial process of rapid mix important?
- Why is the speed of paddles in rapid mix tanks important?
- Describe flocculation.
- What should be avoided during flocculation?
- How do polymers aid flocculation?

Coagulation aids/chemicals used to improve settling – Lesson 2, 8.3

- What are the four most common chemicals added to improve settling of solids?
- What are some general safety precautions when using chemicals?

Polyelectrolytes/polymers – 8.34

- Describe polyelectrolytes.
- How are synthetic polyelectrolytes classified?
- Why are polyelectrolytes used in small doses?
- What cautions should be taken when handling polyelectrolytes?

Dosages and jar testing – 8.4 – 8.41

- What are some of the factors that should be considered when selecting chemicals?
- What is the most valuable tool in controlling and operating a chemical treatment process?
- Describe the jar test procedure.

Clarifiers – Lesson 3, 8.54

- The two basic configurations of clarifiers are based upon what?
- What is one advantage of vertical-flow clarifiers?
- What are some physical characteristics that can affect clarifier efficiency?
- Define “short-circuiting” and some of the causes.

Treatment of Metal Wastestreams – Chapter 11

Methods and sources of metal wastestreams – Lesson 1, 11.0 11.1

- Why can't metal wastestreams be treated with biological processes?
- What is a refractory chemical and how is it usually handled?
- What are some of the procedures for reducing waste treatment costs?

Types of metal wastestreams

- What are chelating agents and how do they affect wastestreams?
- What are “spent baths” and what are the two options for treating them?
- Why are dilute rinse waters easier to treat?
- How and where are valuable metals (gold, silver, etc.) treated?
- Why do cyanide and hexavalent chromium require special treatment?

Treatment processes – 11.3

- What is essential to ensure completion of chemical reactions?
- Precise and accurate control of what is important in physical-chemical reactions?

Batch and continuous process – 11.30

- Batch processes are usually used when dealing with what kind of wastewater flows?
- What kind of processes are easier to control?
- Many operators consider what process as the simplest and most dependable?
- Batch treatment is an effective way to handle what that could overwhelm a continuous process system?
- Continuous flow treatment facilities are used to treat what?

Neutralization – 11.31

- Neutralization of strongly what is required before they are discharged?
- Wastewaters with high pH are neutralized by the addition of what?
- Wastewaters with low pH are neutralized by the addition of what?
- What precautions should be taken when using strong acids or bases?

Common metals removal – 11.32

- Common metals can be removed from wastestreams by what two methods?
- Why must hexavalent chromium and cyanide wastes be removed before other metals?
- What is commonly used when treating wastestreams with different optimum pH levels?
- What are some limitations of the hydroxide precipitation process?

Complexed metals – 11.33

- Why are complexed metals difficult to treat?
- How can complexed metals be treated?
- Explain high pH precipitation.
- Explain the chemical reduction process.

Reduction of hexavalent chromium – 11.34

- Why does hexavalent chromium have to be converted to trivalent chromium?
- How can hexavalent chromium be converted to trivalent chromium?

Cyanide reduction by oxidation – 11.35

- What precautions must be taken during cyanide destruction and why?
- What is the most practical and economical method of treating cyanide wastes?

Precious metals recovery – 11.36

Oily wastes – 11.37

- What are the principal reasons to minimize the discharge of oily wastes from a wastestream?
- What is the source of oily wastes?
- What are the three types of oily wastes?
- What can be used to separate free or floating oils from the wastestream?
- How are emulsified oils treated?

Process instrumentation and controls – Lesson 2, 11.4

Metallic sludge and dewatering – 11.5

- What are some common methods used to dewater metallic sludge?
- What are some of the advantages of filter presses?

Safety – Chapter 13

Lockout/tagout procedures – 13.190

- What are the basic lockout/tagout procedures?
- What is a tagout device?

Excavations – 13.202

Laboratory – Lesson 3, 13.3

- Safety precautions when collecting wastewater samples.
- Labels for chemical containers should have what information?
- What is the largest single cause of accidents in the lab?
- Why should you always wash your hands before eating?
- Which is put in a container first-acid or water?
- Why should chemicals and reagents be handled with care?
- What protective equipment should be worn in the lab?

Fire prevention – 13.4

- What three ingredients are needed for a fire?
- Describe the four classes of fire.
- List some fire prevention practices.

Safety equipment and procedures – 13.6

- What emergency phone numbers should be listed in a noticeable place?

OSHA – 13.12

- What is OSHA and what is it designed to protect?

Industrial Waste Treatment Volume II, (Second Edition):

Activated Sludge Process Control – Chapter 3

Description of process – Lesson 1, 3.0

- Describe the activated sludge process.
- Activated sludge is also known as what?
- Define stabilization and oxidation.
- What must the operator control for the activated sludge process to work properly?
- An increase in organisms in an aeration tank will require greater amounts of what?
- What is an essential control test in an aeration tank?
- What happens in an aeration tank if the DO is too low or too high?
- What is another important control technique in the aeration tank?
- What is RAS?
- What is WAS?

Aeration systems – 3.01

- What is/are the purpose(s) of aeration?
- What are the two methods commonly used to disperse oxygen?
- What are two examples of surface aerators?
- How is oxygen transfer accomplished in surface aeration?
- Describe turbine aeration.
- What is the most common type of aeration system?
- Describe diffused aeration systems.
- Why does compressed air need to be clean?
- Describe positive displacement blowers and its components.
- Describe a centrifugal blower and its components.
- What are the three types of diffusers commonly in use today?

Variations of activated sludge process – 3.02

- What are the three most common activated sludge variations?
- Describe contact stabilization, step-feed aeration, and complete mix.

Return activated sludge – Lesson 2, 3.2

- What is the purpose of returning activated sludge?
- How can RAS be controlled?
- What is the advantage of a constant RAS flow control and where is it an advantage?
- Compare RAS control approaches.
- What are the most commonly used techniques in RAS?
- What are some methods to check the sludge blanket depth?
- At what depth should the sludge blanket depth be kept?
- When should the sludge blanket depth be measured and why?
- Define the 30 minute settleability test.
- Define sludge volume index.

Waste activated sludge – 3.3

- What is the purpose of wasting activated sludge?
- The amount of WAS affects what items?

- Define growth rate.
- Which process controls can be used to control WAS?

Methods of sludge dewatering – 3.31

- Define sludge age and commonly experienced difficulties.
- What facts need to be remembered concerning F/M ratio?
- What does MCRT represent?
- Define nitrification.
- Why is MLVSS used by operators for process control?

Activated sludge microbiology – 3.32

Factors affecting biological treatment of industrial waste – Lesson 3, 3.6 – 3.61

- What are common types of industrial contaminants and their possible effects?
- What are some of the common adverse effects that industrial waste constituents have on unit processes?

Arkansas Regulation 3

Wastewater Math (Reference formula sheet)

Be able to calculate:

- Sludge age
- F/M ratio
- MCRT
- MLSS
- MLVSS
- RAS
- SVI
- WAS flow rate
- Detention time
- Surface loading rate
- Weir overflow rate
- Solids loading
- Chemical Dosage problems