

GRADE IV NEEDS-TO-KNOW

Industrial Waste Treatment, A Field Study Training Program, Office of Water Programs, CSU Sacramento, Volume 1, Third Edition. This manual will be provided by the Certification Committee.

CHAPTER SEVEN – PRELIMINARY TREATMENT

What are the two common methods of flow equalization and know the difference.

When is flow equalization needed?

What are the benefits of equalization?

What are some of the concerns of using the collection system as an equalization system?

Why is adequate mixing important in an equalization tank?

How can short-circuiting be controlled in equalization tanks?

What are the two purposes of blending the equalization tank?

What are the two most typical flow arrangements and how do they work?

Why is screening used to pretreat wastewater?

What is the impact of screening on sewer surcharges?

Coarse screens are also known as?

Understand the operation of coarse screens.

Why are static screens popular in industrial wastewater treatment?

How are static screens cleaned?

What is an advantage of rotating screens?

Internally fed rotating screens treat what types of wastestreams?

Disk filters treat what types of wastestreams?

Understand the basic operation of rotating screens.

How often should screens be visually checked?

Industrial wastewaters require pH adjustment for what purposes?

pH adjustment depends on what factors?

What are some of the common chemicals used to increase pH?

What are some of the common chemicals used to decrease pH?

What is a titration curve and why is it important?

What is titration and why is it important?

What factors influence pH electrode accuracy and response time?

List the three elements of a successful pH control strategy.

What are the two types of mixing for neutralization and what is the difference?

What is residence time and dead time? Why are they important?

List the common pH adjustment systems.

CHAPTER EIGHT – COAGULATION, FLOCCULATION & SEDIMENTATION

What are the three steps to removing solids using chemicals?

What is the difference between coagulation and flocculation?

What is destabilization and why is it important?

Why might chemicals be used in a wastewater treatment plant in addition to removing solids from secondary effluent?

What happens when the paddle speed is too slow or too fast?
What are the four common chemicals added to improve settling of solids?
Why should alum be kept dry?
Why do bulk liquid alum storage tanks need to be protected from cold temperatures?
What are the three polymer charges called?
Why are jar test important?
How are chemical solutions prepared for feeding?
What are the most common types of chemical feeders or metering equipment?
How does a plunger pump deliver chemicals?

DIFFERENT PUMPS HERE

Dry Feed Systems

What are some of the concerns with a screw and vibrating trough feeder?
What considerations should be used to select a chemical feeder?
What are the three common modes of rapid mixing of coagulant chemicals?
How do you remove sludge and oil from a clarifier?
How does a lamella separator work?
What is detention time in a clarifier?
What happens if the detention time in a clarifier is too slow?
What are the possible causes of short-circuiting in a clarifier?
How does flotation thickening occur?
What are the main components of dissolved air flotation units?
What are some of the factors that affect the performance of DAF thickeners.

CHAPTER NINE – FILTRATION

Understand how a gravity filter works.
When should a gravity filter be cleaned?
What is breakthrough in a gravity filter?
What kind of media is used in a depth filtration?
Why should backwash water be of the best quality available?
Why is an effluent rate-control valve needed in a filter?
How would you measure head loss on a rapid sand filter?
When should a filter be backwashed?
What happens to the flow when filters are being serviced?
What is the difference between an inert-media pressure filter and an inert-media gravity filter?
Where is polymer added to a pressure filter?
Know the difference between alum and polymers as related to coagulation and flocculation.
What equipment is necessary to add polymer to a filter?
How are the different types of media placed in a filter?
During what time of the day should the filters be backwashed?
Why should features to bypass filtration systems be provided?
What is the difference between a sand filter and a membrane filter?
What are membrane filtration processes based on?
What are the membrane filtration processes?
What is the life span of a membrane filter?
What pollutants do membrane filters concentrate in the wastestream?
What is “permeate”?
The amount of flux across a membrane is dependent upon what factors?
How do membrane systems prevent the buildup of particles on the surface?
What causes fouling of the membrane surface?

List the common pretreatment processes used for ultrafiltration systems processing primarily industrial waste.

What are the steps for washing a membrane?

How is the effectiveness of a cleaning cycle assessed?

What is osmotic pressure?

What is water flux and mineral flux?

When additional pressure is applied to the side of a membrane with a concentrated solution, what happens?

When higher mineral concentrations occur in the feedwater, what happens to the permeate?

How will an increase in feedwater temperature influence the water flux?

Recovery rate is usually limited by what two considerations?

CHAPTER TEN – AIR STRIPPING AND CARBON ADSORPTION

What is the purpose of air stripping?

What is an advantage of air stripping versus activated carbon?

How does the solubility of chemicals in a wastestream influence the effectiveness of air stripping?

What is the purpose of having vapor phase carbon on the discharge of an air stripper?

What is the probable cause of a high differential pressure across an air stripper?

What are the ways to prevent fouling of air stripper?

How does the carbon adsorption work?

What is the difference between adsorption and absorption?

What are some of the material activated carbon is made from?

The ability of activated carbon to adsorb a contaminant depends on what?

How does the activated carbon system work?

What is the average contact time in an activated carbon treating industrial waste?

What is the countercurrent flow principle?

Why are three-way valves used in activated carbon piping?

What does high head loss indicate?

What conditions might cause an excessive amount of fines in the effluent?

What is the frequency of backflushing the carbon?

What does a low COD removal efficiency indicate?

What is activated carbon regeneration?

What tests are used to evaluate the organics removal efficiency of carbon adsorption unit?

Why is it desirable to have a holding tank or reservoir prior to a carbon adsorption unit?

CHAPTER ELEVEN – METAL WASTESTREAMS

Be able to name some industries that produce metal wastestreams?

What are chelating agents and how do you treat for them?

When is a bath considered to be spent?

What concentration could you expect in a spent plating bath?

What are the two options for treatment of a spent bath?

How is gold, silver treated?

Be able to explain “plate out”.

What are some of the problems associated with organics in the metal wastestream?

Be able to explain why cyanide and hexavalent chromium need to be separated.

When would continuous process operation be utilized instead of a batch operation?

What are some of the chemical used to neutralize a low pH? A high pH?

What process is used to remove common metals?

Be able to interpret a precipitation chart.

What process is used to remove hexavalent chromium?

When would a two stage operation be necessary to remove metals?

What are the limitations of the hydroxide precipitation process?

What are some of the limitations to sulfide precipitation?

What are complexed metals?

Which metals are considered complexed?

What are the three ways to treat complexed metals?

What form must chromium be in to remove the metal?

What pH must be achieved to convert hexavalent Cr to trivalent Cr?

Why is reduction of Cr considered to be a two step operation?

What is the difference between refractory and amenable cyanides?

What is the most critical parameter in cyanide destruction?

What is the most practical and economical method of treating metal wastestreams containing cyanide?

How are precious metals recovered?

What metals can be recovered by the ion exchange process?

What is the advantage of using the ion exchange process instead of metal precipitation?

What are some of the forms of fouling in an ion exchange system used for metal recovery?

Where would you locate pressure gauges on an ion exchange, and why?

How often should pH and ORP probes be cleaned? Calibrated?

Pumps

What factors are considered for pump selection?

What efficiency does a centrifugal pump operate?

Be able to explain how different pumps operate.

Be able to explain different valves found in wastewater.