

Evaporator Operator Training Outline

The following is a partial outline from a pre-evaporator training manual. This manual was developed for an operator training course. Please keep in mind the following attributes of every training course we offer:

- Training customized to your facility. We cover the specific equipment you maintain and operate.
- Training targeted for operators, engineers, and supervisors.
- Process flow sheets specific to your facility are provided and reviewed.
- Training includes field and classroom sessions.
- Plenty of time for Q&A.
- Course manual provided to every student.

1 INTRODUCTION

1.1 HISTORY

1.2 EVAPORATORS

1.3 HOW AN EVAPORATOR WORKS

1.4 SHELL AND TUBE EVAPORATORS

1.5 BASIC EVAPORATOR OPERATION

2 PRINCIPLES OF EVAPORATION

2.1 HEAT TRANSFER

2.2 HEAT TRANSFER EQUATION

2.3 HEAT TRANSFER IN AN EVAPORATOR

3 EQUIPMENT

3.1 EFFECTS

3.1.1 HEATING ELEMENT

3.1.2 FLOWS INSIDE HEATING ELEMENT

3.1.3 VAPOR DOMES

3.1.4 ENTRAINMENT SEPARATORS

3.2 WHITE WATER HEATERS

3.3 SURFACE CONDENSER

3.4 VACUUM SYSTEM

3.5 CONDENSATE FLASH TANK

4 EVAPORATOR FLOWS

4.1 LIQUOR SYSTEM

4.2 STEAM/VAPOR

4.3 CLEAN CONDENSATE

4.4 PROCESS CONDENSATE COMBINED

4.5 FOUL PROCESS CONDENSATE

4.6 NON-CONDENSIBLE GASES

4.7 WHITE WATER HEATING

4.8 COOLING WATER

5 TROUBLESHOOTING

5.1 Low Capacity

5.1.1 Steam Pressure And Condenser Vacuum Are Normal

5.1.2 Decreased Steam Flow (Steam Pressure And Vacuum Normal)

5.1.3 Normal Or Above Normal Steam Flow (Steam Pressure & Vacuum Normal)

5.1.4 Condenser Vacuum is Below Normal

5.1.4.1 Fouled Condenser

5.1.4.2 High Condensate Level in Condenser

5.1.4.3 Vacuum Leaks

5.1.4.4 Vacuum Pump Problems

5.1.4.5 Cooling Water Problems

5.2 CONTAMINATED CONDENSATE

5.2.1 Foaming

5.2.1.1 Weak Liquor

5.2.1.2 Air

5.2.2 High Liquor Level

5.2.2.1 Liquor Transfer Pump Problems

5.2.2.2 Blockage In The Liquor Pipe

5.2.2.3 Poor Liquor Level Control

5.2.2.4 Liquor Recycle

5.2.3 Broken Outside Perimeter Tubes

5.2.4 Entrainment Separator Problems

5.2.4.1 Mechanical Damage to Separators

5.2.4.2 Improper Drainage

5.2.4.3 Plugged Drains

5.2.4.4 Drain Seal "Blow-Out"

5.2.4.5 Overload

5.3 INSTABILITY

5.3.1 Unsteady Liquor Flow

5.3.2 Periodic Vacuum Leak

5.4 CONCLUSION