CONSIDERATIONS FOR TOTAL POLLUTION CONTROL:

ENERGY CONSERVATION & PROCESS CONTROL UTILIZING COVERED TANKS

Rick Hall

KCH Services, Inc.

INTRODUCTION

- Focus - Minimization of Air Volumes
- Industrial Ventilation Fundamentals
- Purpose - Control Worker Exposure
- Extend Building & Equipment Life
- OSHA Requirements - PEL’s
- General Ventilation
- Local Exhaust
- Capture Velocity
- Capture Efficiency
- Make-up Air - Tempering
- Cost Reduction Methods

COVERED TANK CONCEPT

- Automatic Tank Covers - Benefits
- Automatic Tank Covers - Design Assumptions
  - ACGIH Industrial Ventilation Manual Used
  - 50-250 CFM/Ft2 Exhaust Rate
  - Automatic or Manual Hoist
  - Lateral Style Hoods
- Covers Allow 2/3 Reduction of Exhaust Flow Rate and System Size

EXAMPLE

- Tank Dimensions 3’ Wide X 6’ Long
- 900 - 4500 CFM Required @ 50 - 250 CFM|ft2
- Average - 2700 CFM
- Example System has 10 tanks, single hoist
- Total System Volume (Open Top Tanks) = 10 x 2700 = 27,000 CFM

EXAMPLE cont.

- Double lateral hoods mounted to tank top
- Automatic Hood Dampers
- Hood Damper Operation
- Tremendous Savings

COVERED TANK DESIGN ASSUMPTIONS

- All tanks normally closed
- Perimeter draws in room air - Prevents fume escape
- Covers open - full ACGIH exhaust rate
- Automatic relief damper maintains constant air flow through control device

SYSTEM SIZING

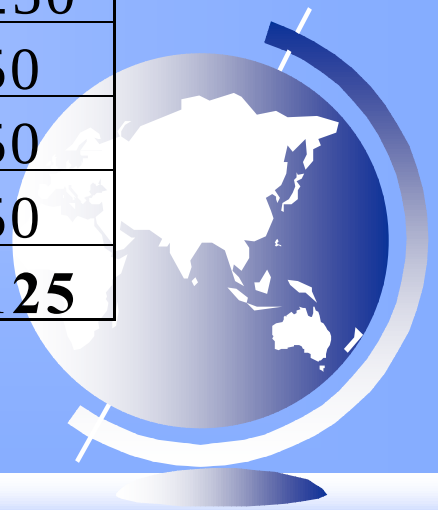
- All covers are normally closed
- Worst case tank is open - one per hoist
- One hoist - one cover open
- Two hoists - two covers open
- System sizing is dependent upon number of hoists

RECAP

- (9) of (10) tanks sized @ 25% = (9)(.25)(2700) = 675cfm
- Worst case tank requires 4500cfm
- Total = 675cfm + 4500 cfm = 10, 575 cfm
- Open top volume = 27,000
- Net Savings = 16,425 cfm …. 60%

CASE STUDY

STATION	PROCESS	MIN. CFM	MAX. CFM
4	Immersion Rinse	1,500	4,050
5	Sodium Dichromate	11,250	11,250
7	Immersion Rinse	1,500	4,050
8	Alkaline Clean	1,500	5,850
11	Alkaline Clean	1,500	7,875
12	Immersion Rinse	1,500	5,850
14	Pasa Jel ™	1,500	11,250
15	Immersion Rinse	1,500	4,050
18	Paint Strip	1,500	5,850
19	Immersion Rinse	1,500	4,050
	TOTAL	**24,750**	**64,125**



CASE STUDY cont.

- Minimum Operational Requirements (Worst case cover open, all others closed): 24,750cfm
- Maximum Operational Requirements (All covers open): 64,125cfm
- Net Savings = 39,375cfm

HIDDEN IMPACT

- Utility pollution reduced without reducing worker safety

ECONOMICS

- Savings
  - Reduced fan horsepower
  - Reduced heating in winter
  - Reduced scrubber size

ECONOMICS cont.

- Horsepower (HP) cost savings
  - 64,124 CFM = 84.36 HP
  - 24,750 CFM = 30.11 HP
- Reduction = 54.25 HP
- Exhaust runs continuously
- Savings = $7,485/year

HEATING COST SAVINGS

- Use cost calculation in Industrial Ventilation Manual
- Annual cost = $40,904
  - Based upon fuel cost of $5.00 per million BTU/Hr.
- Dramatic saving pays for capital cost of covers

SCRUBBER SIZE REDUCTION

- 70,000 CFM Scrubber requires (2) 7.7 HP pumps
- 25,000 CFM Scrubber requires (1) 5 HP pump
- Annual Energy Savings = $3,921

GLOBAL POLLUTION

- Reduced energy consumption = reduced global pollution
- Natural Gas
  - Natural gas heating capacity = 1,000 BTU/ft3
  - 8,180 million BTU requires 8.18 million Ft3
  - 1,389,588 lbs of CO_2 produced as byproduct

GLOBAL POLLUTION cont.

- Coal fired electrical production is 35-40% efficient
- Reduced fan and pump HP = 419,870 KWH/Yr.
- 852,644 lbs. of CO2 would be produced
- 1,075 lbs. of particulate matter would escape
- 1,969 lbs. SO2 would be produced

ANNUAL TOTAL IMPACT

- Electricity Saved……419,870 KWH
- Natural Gas Saved……8,810 mm BTU
- Total Dollar Savings……$66,096
- Total CO2 Not Emitted…….1,121 Tons

SUMMARY

- PELs
- Reduction of air flow through covers
  - Energy savings
  - Dollar savings
  - Global pollution savings