Proper Tube Mill Coolant

"Best Practices and Running a Profitable Mill"

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TUBE MILL CONSIDERATIONS

- Evaluation of the Tube Mill
- Tube Mill Modifications / Needs
- Selection of Tube Mill Coolant
- Coolant Maintenance
- Machine Lubricant Compatibility
- Special Considerations

Evaluation of the Tube Mill

- Tanks / Reservoirs
- Clarification Equipment
- Tramp Oil Removal
- System Design

TUBE MILL EVALUATION

RESERVOIR SIZE:

- 10-20 Minute Retention Time – ***Bigger is Better***
  (Minimum Size = 10 to 20 times max GPM values of coolant pump)
- Proper Capacity Allows Metal Fines to Drop Out
- Extra Retention Time Provides Additional Cooling
- Set-up Quiet Area for Skimming Tramp Oil
- Allows Entrapped Air to Dissolve

TUBE MILL EVALUATION

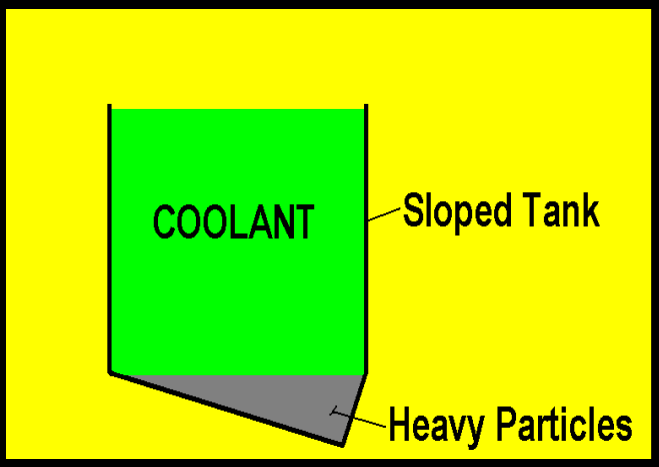
IN-GROUND TANKS

- Locate Reservoir Away From Tube Mill
  - Reduces or Eliminates Floor Sweepings, Machine Oil, and other Debris from Entering Reservoir
- If Concrete, Be Sure to Seal Reservoir
- Make Surface Area as Large as Possible
  - (see next slide)

TUBE MILL EVALUATION

FLOOR TANKS

- Locate Away from Tube Mill
- Make Surface Area as Large as Possible
  - Ideal for Skimming Tramp Oil
  - Quite Zone for Settling, Filtration and Separation
  - Promotes Coolant Heat Dissipation



Example

- System provides 10 GPM – Flood Coolant
- 20 minute retention time
- =200 gallon reservoir
  - That's 3' x 4.5' x 24" deep
- Many sump are undersized for system
- Settling, Oil Separation, Cooling

TUBE MILL EVALUATION

COOLANT CLARIFICATION / GRAVITY

- Baffles
  - Drop Out Heavy or Large Residuals
  - 2nd Baffle at Lower Height to Drop Out Finer Particles
  - Make Baffles Removable (easier cleaning)

TUBE MILL EVALUATION

COOLANT CLARIFICATION / MECHANICAL

- Bag Filters
  - Low Cost Way to Remove Foreign Particles
- Paper Filter / Bed Filter
  - Removes Finer Particles
  - Cost Effective
  - Auto-Advancing / Collecting
  - Match Paper to Type of Coolant

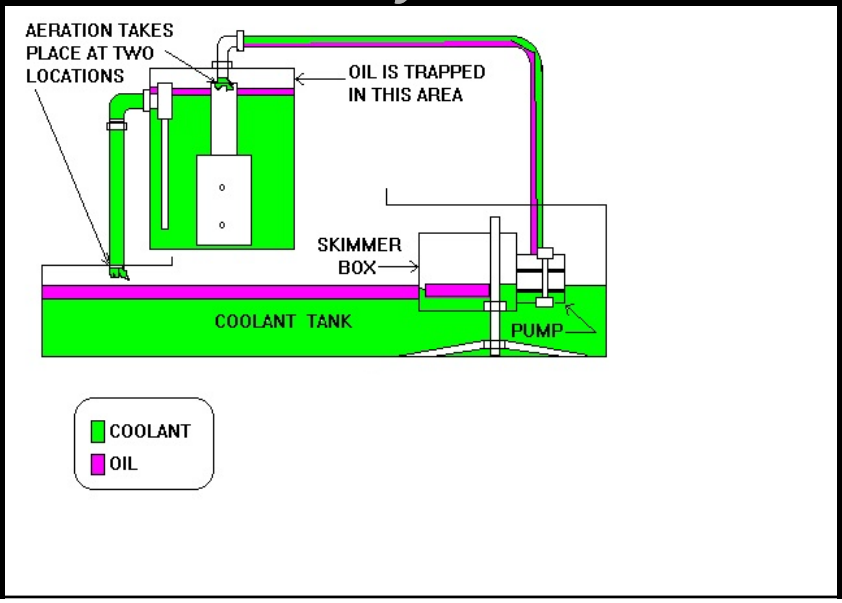
TUBE MILL EVALUATION

OIL REMOVAL EQUIPMENT

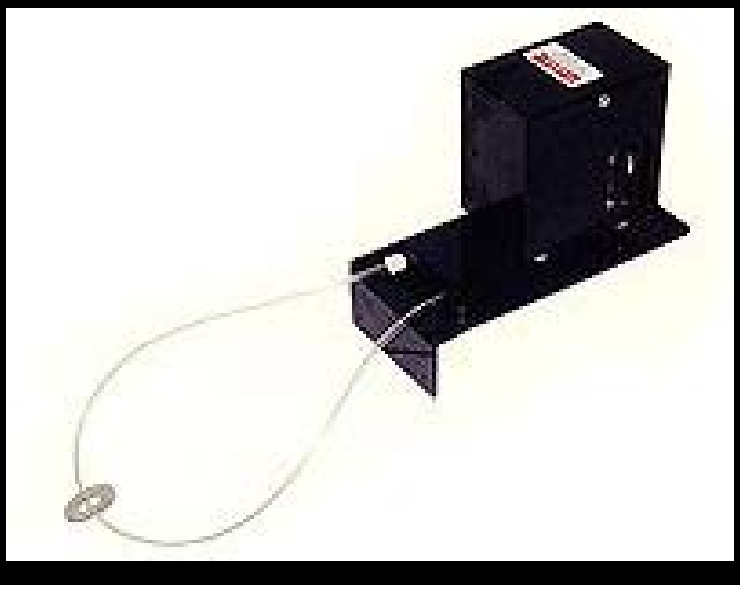
- Tramp Oil Separator
  - Removes Tramp Oil from Coolant on a Continuous Basis
- Oil Skimmer
  - Removes Tramp Oil from Surface of Reservoir
  - Mandatory if *Tramp Oil Separator* is Not Possible

Tramp Oil Separator

Tank Side Oil Separator Layout



Rope Style Oil Skimmer

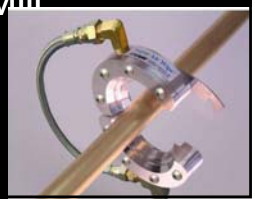


Belt

Disk

TUBE MILL MODIFICATIONS

- Longer Run Out Tables
  - Enables Tubing to be Drained More Readily
  - More Coolant can be Recovered & Clarified
  - Cleaner, Dryer Tubing (less chance of rust)
- Blow-Off / Air Knife
  - Blow Excess Coolant Back to the Mill
- Clarification Equipment
  - Consider Additional Filtration
    - Coolant Return Side Filter Bags



TUBE MILL MODIFICATIONS

- In-Ground Tanks
  - Replace with Floor Tanks
  - Add Curbs Around Tank
- Floor Drains/ Trenches
  - Add Nozzles to Keep Drains and Trenches Clear of Debris
  - Add Slop Tank To Collect Debris from Trenches

SELECTION OF TUBE MILL COOLANT

1. EVALUATE WATER SOURCE

- 93 – 95% of Your Coolant is Water

  Bad Water = Bad Coolant
- Check Water Source (Before you *START!)*
  - pH
  - Hardness
  - Microbial Growth

  Effects:

  Coolant Stability, Corrosion Protection, Smell, Spotting, Dermatitis, Scale, Build-up, etc.

SELECTION OF TUBE MILL COOLANT

2. TYPES OF TUBE MILL COOLANTS

- Soluble Oils / Macro-Emulsions
- Semi-Synthetics / Micro-Emulsions
- Synthetics / Chemical Solutions

SELECTION OF TUBE MILL COOLANT

CHEMISTRY OF SOLUBLE OILS

- Petroleum Oil
- Lubricity Additives
- Extreme Pressure Additives
- Corrosion Inhibitors
- Emulsifiers
- Anti-Microbial Additives
- Anti-Foam Additive

SELECTION OF TUBE MILL COOLANT

ADVANTAGES OF SOLUBLE OILS

- Good Cooling
- Excellent Lubricity
- Higher Extreme Pressure Than Synthetics
- Economical to Waste Treat
- Leaves Light Oily Film

SELECTION OF TUBE MILL COOLANT

CHEMISTRY OF SEMI-SYNTHETICS

- Petroleum Oil (2% - 30%)
- Extreme Pressure Additives
- Lubricity Additives
- Corrosion Inhibitors
- Emulsifiers
- Anti-Microbial Additives
- Anti-Foam Additive

SELECTION OF TUBE MILL COOLANT

ADVANTAGES OF SEMI-SYNTHETICS

- Affords Better Cooling than Soluble Oils
- Washes Well in Aqueous Cleaners
- Increased Sump Life vs. Soluble
- Weld Through Residue
- Recycleable

SELECTION OF TUBE MILL COOLANT

CHEMISTRY OF SYNTHETICS

- Oil Free
- 40% - 70% Water
- Lubricity Additives
- Extreme Pressure Additives
- Rust Inhibitors
- Anti-Foaming Additives

SELECTION OF TUBE MILL COOLANT

ADVANTAGES OF SYNTHETICS

- Superior Cooling
- Clean Parts
- Weld Through Without Smoke
- Longer Sump Life
- Minimal Residues

SELECTION OF TUBE MILL COOLANT

VALUE ANALYSIS

- Performance
- Disposal Costs
- Consumption
- Environment
- Health, Safety, EPA & OSHA

COOLANT PERFORMANCE

HEAVIEST DUTY	**VS.**	**PROCESS FRIENDLY**
1. Soluble Oils		1. Synthetic Solutions
2. Semi-Synthetics		2. Semi-Synthetics
3. Synthetic Solutions		3. Soluble Oils

COOLANT PERFORMANCE

Chemistry	Cooling	Lubricity	Weldability	Residues	Sump Life
Soluble Oil	Good	Best	Good	Oily Film	Good
Semi-Synthetic	Better	Better	Better	Varying	Very Good
Synthetic	Best	Good	Best	Minimal	Excellent

4000 GAL. SYSTEM ANNUAL COST

- 4000 gallon sump (8' x 16' x 4' deep)
- Line Cost - $300 per hour
- Labor Rate - $50 per hour
- Disposal Cost - $0.50 per gallon
- Coolant Cost
  - Low Cost Choice - $12 per gallon
  - High Performance Choice - $18 per gallon

4000 GAL. SYSTEM – ANNUAL COST

- Downtime to Dump/Clean/Recharge System
  - 8 hours X $300/hr = $2,400 per dump
- Labor (3 workers)
  - 24 hrs X $50 hr = $1,200 per dump
- Disposal
  - 4000 gal. X $0.50/gal. = $2,000 per dump

- Costs for a System Dump - $5,600
  - Coolant Cost not factored in

4000 GALLON SYSTEM - ANALYSIS

Low Cost Coolant

- $12 per gallon
- Running Ratio – 15:1
- Gallons per Charge – 250
- Cost - $3,000 per charge
- Dump Twice per Year

- $3,000 + $5,600 = $8,600 X 2 = $17,200 per year

4000 GALLON SYSTEM - ANALYSIS

High Performance Coolant

- $18 per gallon
- Running Ratio – 15:1
- Gallons per Charge – 250
- Cost - $4,500 per charge
- Dump Once per Year

- $4,500 + $5,600 = $10,100 per year

4000 GALLON SYSTEM - ANALYSIS

- Low Cost
  - Dump 2X per year
  - Dumping Costs - $11,200
  - Coolant Costs - $3,000
- Total Costs - $17,200

- High Performance
  - Dump 1X per year
  - Dumping Costs - $5,600
  - Coolant Costs - $4,500
- Total Costs - $10,100

Total Savings - $7,100 by using High Performance Coolant

COOLANT VALUE ANALYSIS

- Consumption
  - Drag Off
    - Air Blow Off / Vacuum
    - Longer Run Out Tables
    - Semi-Synthetic vs. Soluble
      - 30% Less Drag-Off
    - Full Synthetic vs. Soluble
      - 50% Less Drag-Off

COOLANT VALUE ANALYSIS

- Consumption (continued)
  - Coolant Life Issues
    - Coolant Ruined by Excessive Contaminants
    - Instability Of Coolant Caused By Particles, Greases, and Residuals which have not been Properly Removed

Increased Performance / Life Requires Proper Filtration & Tramp Oil Removal

COOLANT VALUE ANALYSIS

THE ENVIRONMENT

- Monitor & Control your Process Fluids
- In-Plant Training
- Know your Local Regulatory Laws Understand your Processing Environment
- Establish a Waste Oil Minimization Program

COOLANT MAINTENANCE

- Keep Coolant at Proper Level & Clean
- Maintain Filtration
- Add Coolant at Recommended Make-up Ratios
- Make Concentration, Biological, and pH Checks as Recommended by your Supplier
- Keep Records of Coolant Condition
- Unusual Changes in Coolant
- Appearance & Odor

COOLANT MAINTENANCE

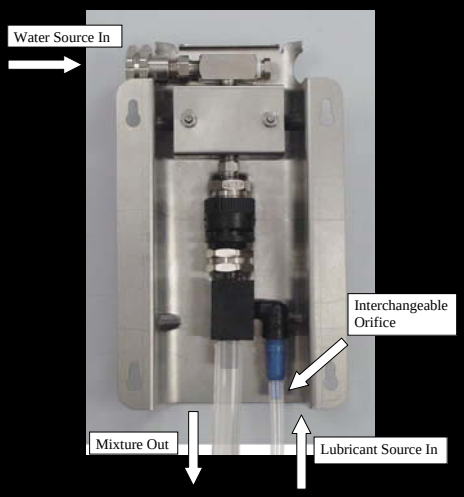
- Storage & Handling of Coolant Concentrate
  - Store in a Clean, Dry Indoor Location
    - (Do Not Store Below 40°F)
- Proper Mixing of Coolant
  - Adjustable Proportioners

Proportioners

- Venturi Type
- Consistent Ratios
- Easy to Use
- Easy to Change

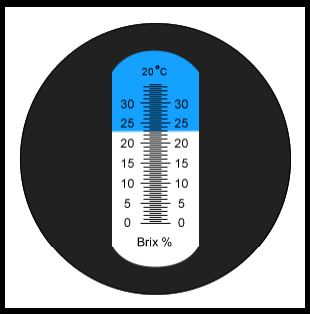
Proportioners

- Venturi Type
- Fixed Orifice
- Variable
- One for Charging
- One for Make-Up



COOLANT MAINTENANCE

- Checking Coolant Concentration
  - Check Concentration Daily
  - Titration Kit
    - Uses Chemicals To Check For a Particular Component (good for synthetics)
  - Acid Split
    - Removes Oil (good for soluble oils)
  - Refractometer
    - Measures solids using light (good for syn. & semi's)



COOLANT MAINTENANCE

- pH Control
  - pH Paper
  - pH Meter
- Check For Biological Activity Levels
  - Bio-Sticks
  - HMB Test
  - Supplier's Lab

COMPANY NAME CITY, STATE
TUBEFORM 580 COOLANT CONTROL CHART

MACHINE # **DAILY CONCENTRATION CHART**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
CONC: 5:1											X																				RI = 17.5
CONC: 10:1			X	X						X																					RI = 10.1
CONC: 15:1	X	X			X	X			X			X																			RI = 7.0
CONC: 20:1							X	X																							RI = 5.3
CONC: 25:1																															RI = 4.3

pH READINGS / TRI-WEEKLY

pH	M	W	F	M	W	F	M	W	F	M	W	F	M	W	F
10															
9.75									X	X					
9.50	X	X				X	X	X			X	X			
9.25			X	X	X										
9.00															
8.75															

pH RANGE

HIGH
10.00

LOW
8.75

READINGS TO BE OBTAINED BY HAND HELD Ph METER PER INSTRUCTIONS.
ACTION POINTS ARE 8.75 pH LOW, 10.0 pH HIGH.

ADD SYSTEM Ph CONDITIONER AS RECOMMENDED

ADDITIVE 32
Designed as a "booster" to restore depleted TOWERKEM solutions. Restores both rust protective and pH additives. Use 1/2 gallon per 100 gallons of coolant.

REFRACTOMETER READING	CONCENTRATION
17.5	5:1
10.1	10:1
7.1	15:1
5.3	20:1
4.3	25:1

UPPER / LOWER ADJUST POINTS

OUT OF TOLERANCE

COOLANT MAKE-UP ADD AT A MIX RATIO OF 20:1 (5%

CHECK COOLANT RESERVOIR DAILY. REMOVE ANY EXCESS TRAMP OIL FLOATING ON TOP OF COOLANT.

OBSERVE COOLANT CONDITION - IE., COLOR, SMELL, DIRTY, FOAM, ETC. AND NOTE ON SYSTEM OBSERVATIONS SECTION BELOW.

SYSTEM OBSERVATIONS: 4/11 - conc too strong, adjusted to 15:1 JH

COOLANT MAINTENANCE

- Tank Side Conditioners
  - Oil Rejection Additives
    - Synthetics Only
  - pH Adjusters
  - Anti-Foams
  - Anti-Microbial Additives

MACHINE LUBRICANT COMPATIBILITY

1. Roll Stand Bearings
   - Use Proper Grease for all Water-Extendable Coolants – esp. Synthetics
2. Shaft / Tooling Parting Lube
   - High Water Resistant Lube with Teflon
3. Turkshead & Weld Zone Bearings
   - Use Extreme Pressure, Heat Resistant Grease
4. Gear Boxes
   - Use Synthetic Oils for Higher Temperature Applications

Lubricant Compatibility – Process

- Pre-Notch & Punching
- Mid-Notch & Punching
- Secondary Sizing / Forming
- Post Notch
- Cut-Off

(Every lubricant used with each process must be compatible)

Lubricant Compatibility – Mill Equipment

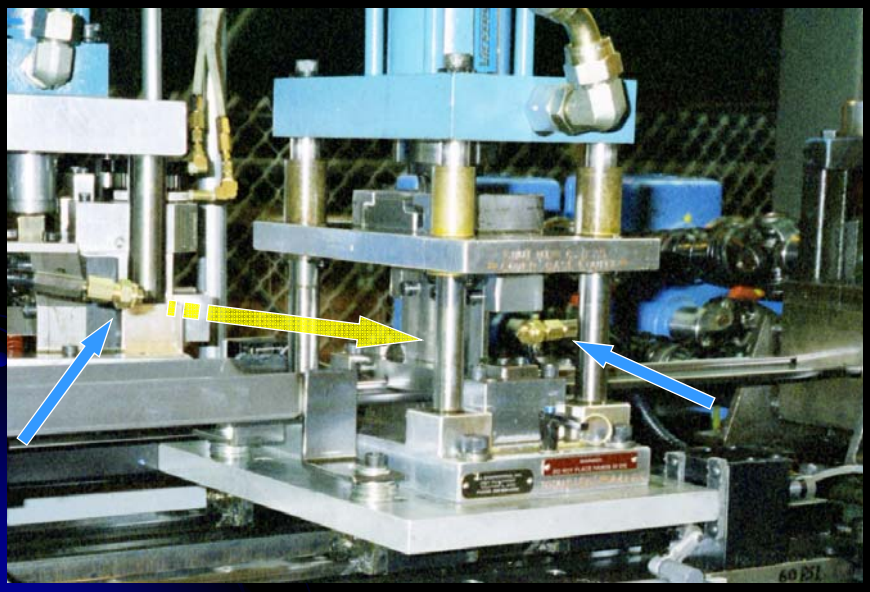
- Roll Stand Bearings (grease wash out / petroleum distillates & synthetics)
- Rolls And Shafts (parting lube / petroleum distillates & water based coolants)
- Gear Boxes (leakage / water separating)
- Rafted Tooling Sets (corrosion protection)
- Dies & Cut-Off (tool protection / blade life)

SPECIAL CONSIDERATIONS

Cut-Off Lubricants

- Light Duty
  - Same as Tube Mill Coolant But More Concentrated
- Heavy Duty
  - Compounded Straight Oil which is Compatible with Coolant

Airless Spray Systems / Set-up



SPECIAL CONSIDERATIONS

Corrosion Protection

- Limited Time / In-Process
  - Mill Coolant Alone
    - Relies on Uniform Coverage and Coolant Carry-Off
  - Water-Based Chemical RP Over Mill Coolant
    - Spray, Drip or Flood
    - Applied on Top of Coolant Carry-Off

SPECIAL CONSIDERATIONS

Corrosion Protection

- Extended Protection
  - Spray or Drip After Blowing-Off Excess Coolant
- Dry Film
  - Dry to Touch
  - Coolant Displacing
- Oily Film
  - Light Residue to Heavy Oil Film
  - Thixotropic Film (self-healing)

SPECIAL CONSIDERATIONS

Producing Cleaner Tubing

- Process Considerations
  - Purchase Cleaner Material
  - Use Synthetic Coolant
  - Improve Coolant Filtration
  - Remove Excess Coolant
  - In-Line Drying Systems
- Storage Considerations
  - Tilted Material Carts
  - Vertical Stacking

PARTNER WITH YOUR LUBRICANT SUPPLIER

- Health And Safety Issues
- Selecting Lubricants is a Complex Process
- Testing And Data Points
- Customize Your Lubricant

Thank You

Any Lubrication Questions, Problems and/or Experiences you would like to share ?

Steve Lowery

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