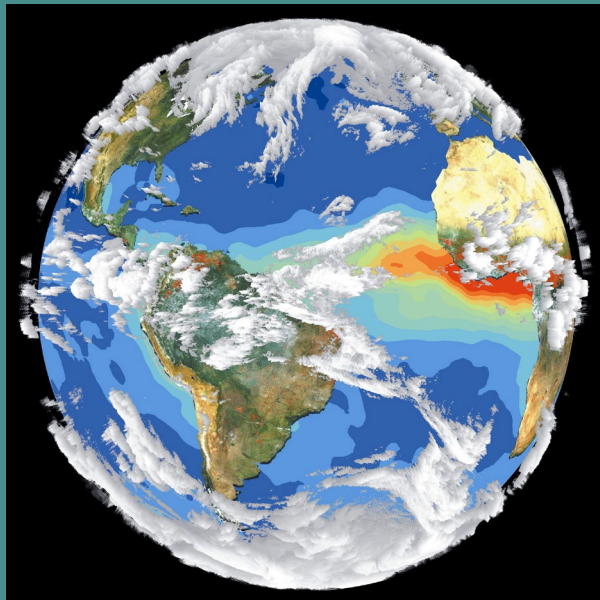




SCUM HANDLING & CAKE TRANSPORT TWO DIFFERENT WORLDS

OWEA BIOSOLIDS DECEMBER 6, 2018



SCUM HANDLING



SCUM HANDLING

“The unusual characteristics of scum which may adversely affect pumping, piping, sludge handling and disposal, shall be recognized in design. Provisions shall be made to remove from the wastewater treatment process and direct to sludge treatment process. Other special provisions for disposal may be necessary.”



SCUM REMOVAL/MANAGEMENT

- Why is it important?
 - Increases organic loads
 - Operational issues
 - Odors
 - Visual blight
 - Lines pipes reducing diameter increasing headloss
 - Contribute to pump & valve clogging



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WHERE IS SCUM REMOVED?

- Typically in the primary sedimentation tanks – majority
- Smaller fraction on finals which can increase if no primary tanks
- Tighter screening has allowed more removal by the screen equipment



WHERE IS SCUM REMOVED?

- Dead end of channels – especially primaries
- Influent pump station - wetwell



SCUM QUANTITY & COMPOSITION

- Highly variable based on industrial and commercial loads
- Recycle streams handled
- Removal efficiency of equipment
- Collection system, can deliver slug loads



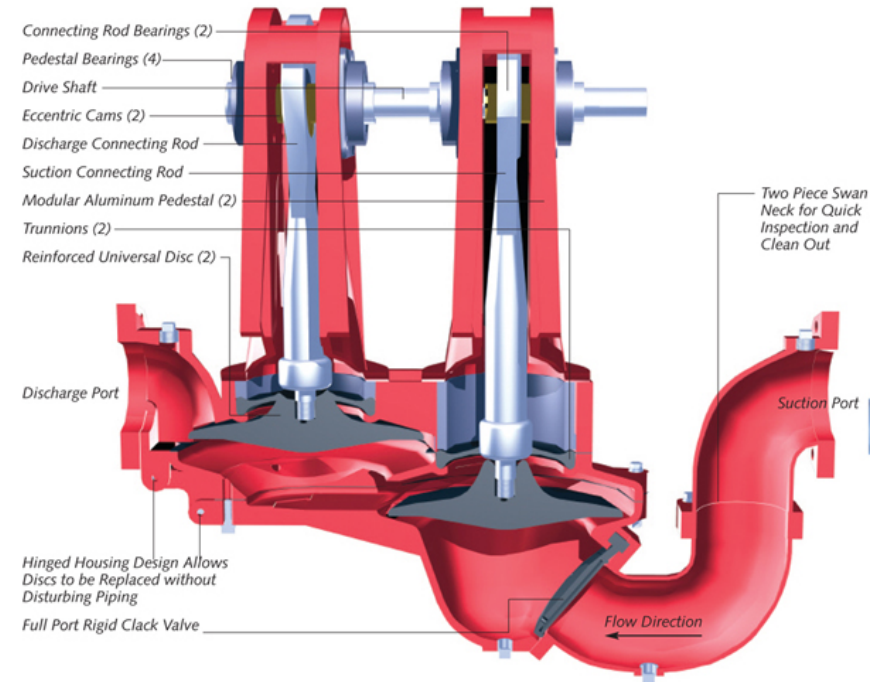
SCUM QUANTITY & COMPOSITION

- Approximately 90% volatile
- 75 – 89% oil and grease
- 6,500 BTU/lb. fuel value



SCUM PUMPING

- Style of pumps utilized?
 - Chopper pumps
 - Recessed impeller – WEMCO
 - Diaphragm – PENN Valley Piston pumps



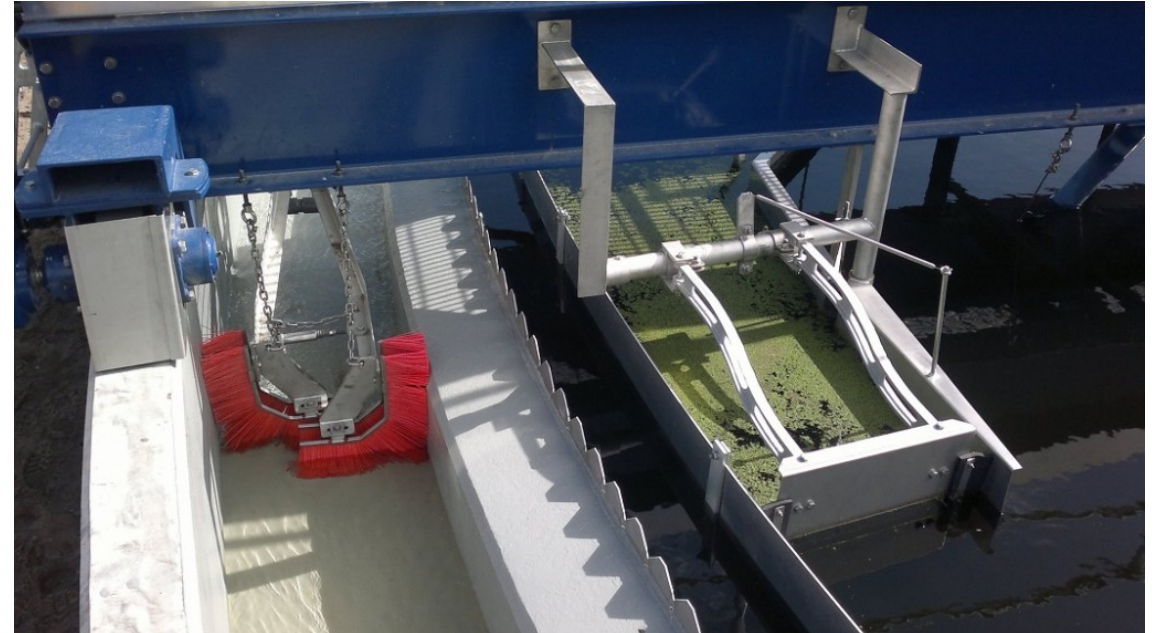
SCUM TRANSPORTATION LINES

- Design considerations
 - Slope bottom of tank or manhole
 - Consider mixing of contents
 - Flushing connections or pigging stations
 - Cleanouts
 - Avoid 90 degree elbows
 - Glass lined piping



SCUM REMOVAL MECHANISMS

- Primary tanks
 - Rectangular tanks – full length tipping troughs either manual or automated
 - Circular tanks – scum beach
 - Separate collection manhole
- Final tanks – chiefly a scum beach



SCUM TREATMENT

- Scum concentrators
 - Separate stainless steel or carbon steel tank similar to a rectangular primary
 - Options can include a variable skimmer timer and adjustable overflow weir
 - Can be covered for odor control
 - Discharge to container or holding tank



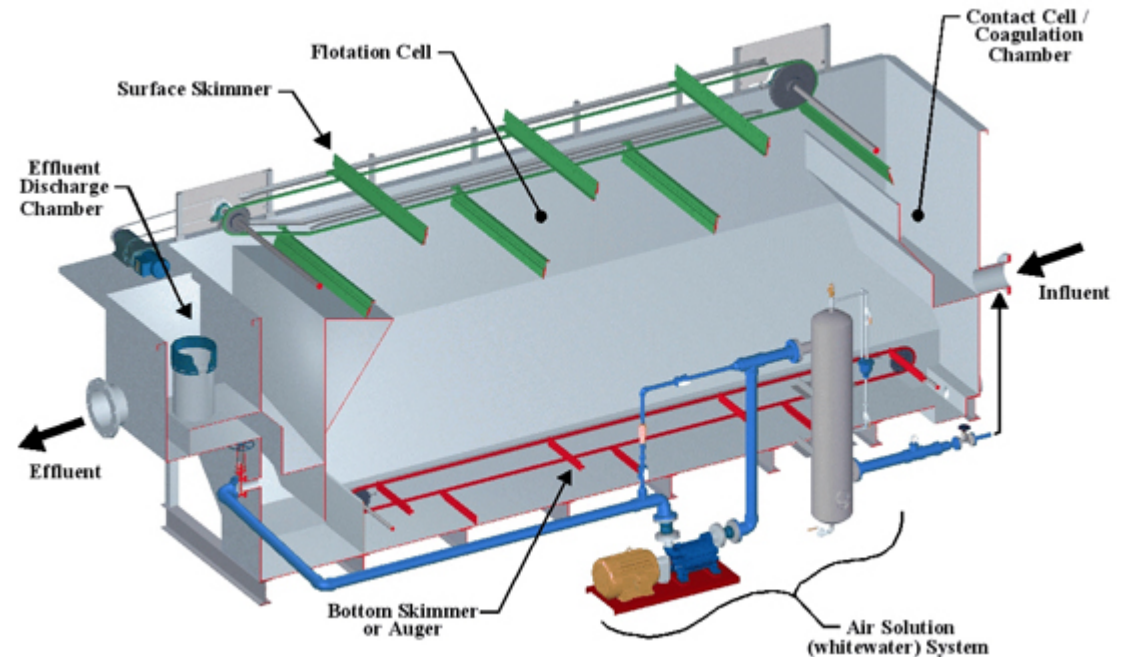
SCUM TREATMENT

- Heated batch tank
 - Heated to further reduce and homogenize
 - Mixer required
 - Heating element on the outside of the tank
 - Product sent to incinerator or anaerobic digester



SCUM TREATMENT

- Dissolved air floatation
 - More often seen on industrial applications with higher grease loadings
 - Microbubbles utilized to float the grease/scum for removal by a skimmer
 - Denser particles are settled and removed as a sludge



SCUM TREATMENT

- Screening
 - Externally fed
 - Size based on pumped flow
 - Spray wash to prevent clogging





LIMA'S SCUM HANDLING

- Two systems
 - Older system – primaries 5, 6, 7
 - Simple decant tank



LIMA'S SCUM HANDLING



- Simple operation – fill to over weir
- Air to float grease
- Dumpster disposal



LIMA'S SCUM HANDLING

- Second system
 - Four new primaries 1-4
 - Full length scum trough



LIMA'S SCUM HANDLING

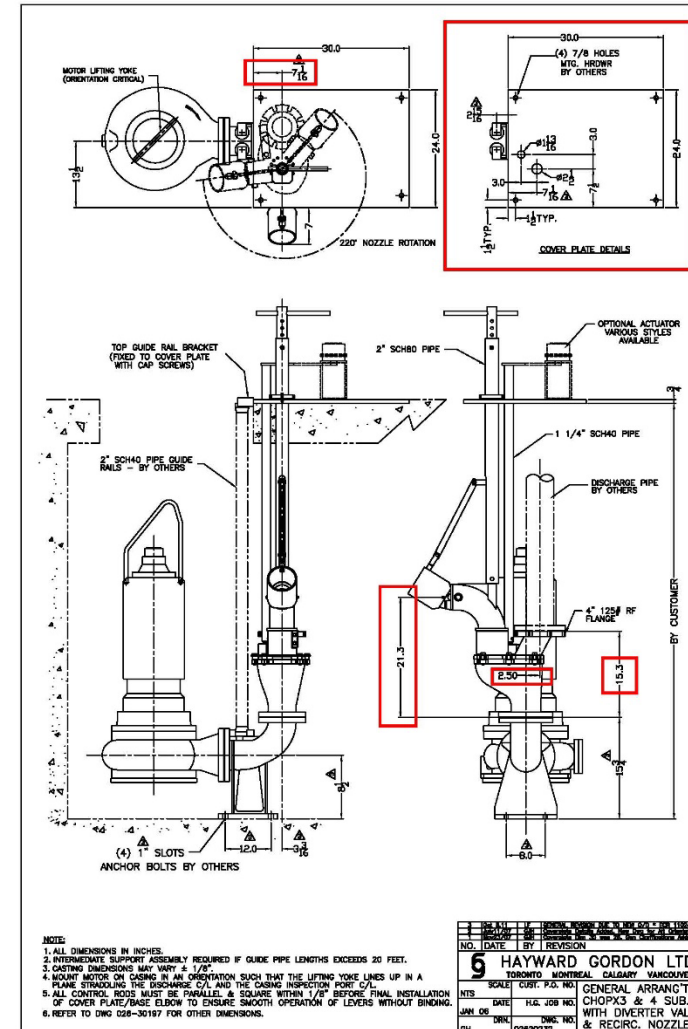
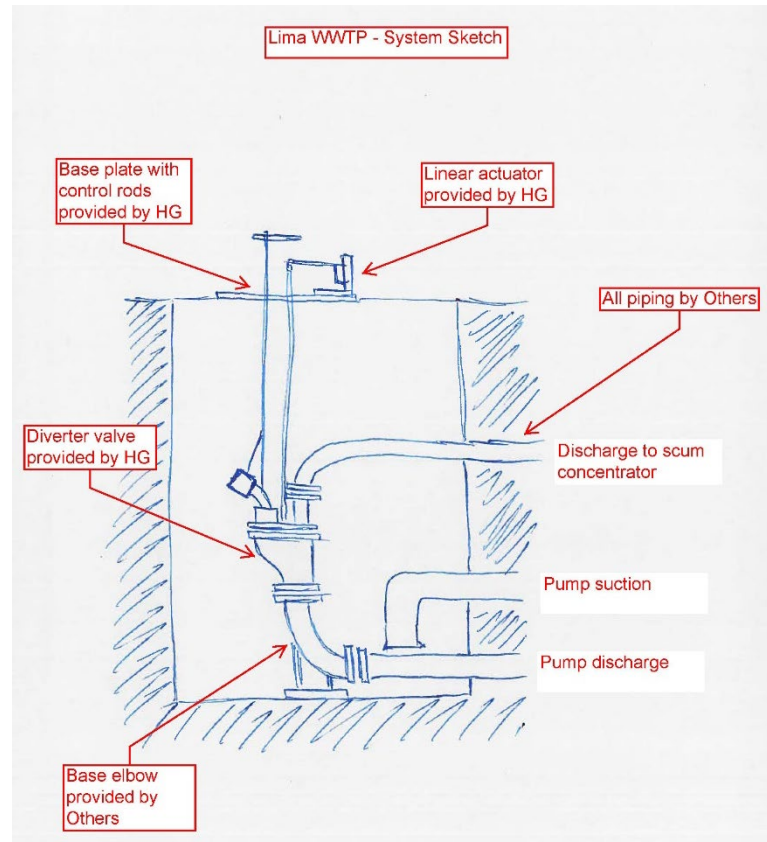


- Pumped by one of two Hayward Gordon chopper pumps
- Wet well includes internal recycle homogenize the scum and grease



LIMA'S SCUM HANDLING

Wet Well Recycle System



LIMA'S SCUM HANDLING

New internally feed scum screen with compaction



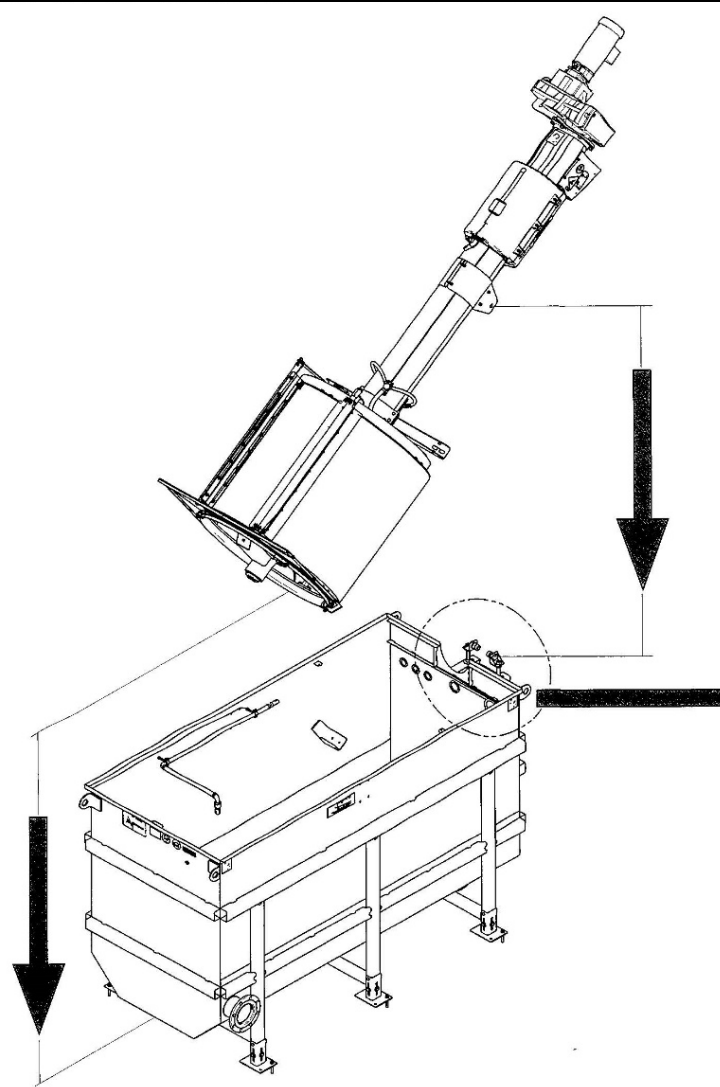
LIMA'S SCUM HANDLING

Design Details

- 304 stainless steel construction
- Tank mounted
- Shafted stainless steel screw
- 35° inclined screen basket
- Wedge wire opening size: 0.5mm
- Integrated screenings spray washing system IRGA
- Closed discharge chute with bagging unite attachment
- Booster pump included



LIMA'S SCUM HANDLING



LIMA'S SCUM HANDLING

Integrated System Washer	
Preliminary washing	Spray bar on the right trough edge
Washing with pressure	Spray bar on the base plate over the trough
Fine washing	3 nozzle units on the rising pipe connected with pressure hoses



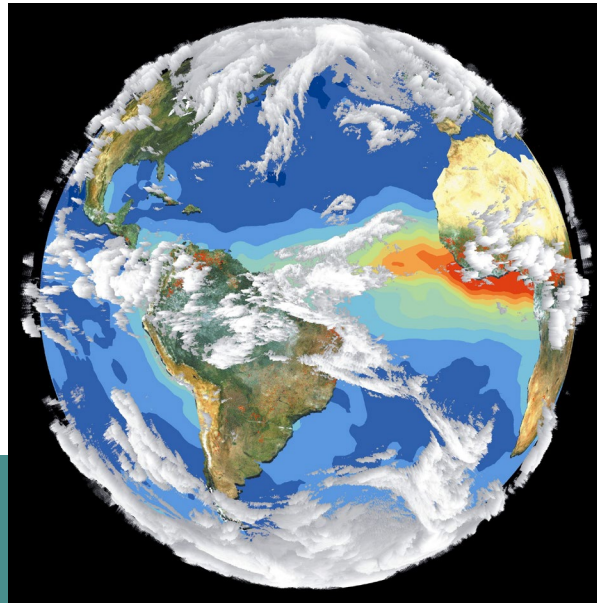
LIMA'S SCUM HANDLING

How has it been going?

- Relocated sonic level detector
- Have plugged with a certain food waste grease
- Maybe adding hot water



CAKE TRANSPORT



“Before the methods or methods of cake transport for a given application can be selected, specific requirement of the solids process train, site on building constraints, reliability, O&M and life-cycle costs should be analyzed.”



WHY GENERATE A CAKE?

- Chiefly to Haul to a Landfill
- Reduce Storage Costs, Cake Less than Liquid
- Production of a Class A Material
- Incineration



OPTIONS FOR CAKE PRODUCTION

- Belt Press
- Centrifuge



OPTIONS FOR CAKE PRODUCTION

- Screw Press
- Volute Press
- Rotary Fan Press



DESIGN CONSIDERATIONS FOR CAKE TRANSPORTATION

- Start at the end – Disposal
- Landfill
 - How do we want material delivered?
 - Dump trucks – Who is hauling
 - Dumpsters
 - Do they have daily limits?
 - What are their operational hours?



DESIGN CONSIDERATIONS FOR CAKE TRANSPORTATION

- Start at the end – Disposal
 - Land Applications
 - Covered
 - Size – Simple Volume of Storage
 - Discharge Locations
 - Inside/Outside
 - Odors



DESIGN CONSIDERATIONS FOR CAKE TRANSPORTATION

- Class A
 - Single Location – Multiple
 - Batch Process
 - Feed Rates
- Incinerator



CAKE TRANSPORTATION OPTIONS

Direct Deposit

Belt Conveyors

Screw Conveyors

Progressive Cavity Pumps

Cake Pumps

WHAT DO I NEED TO KNOW FOR ALL ALTERNATIVES

- Maximum Feed Rate
lbs/hr – wet or dry
- Minimum & Maximum % Solids
- Basic Layout

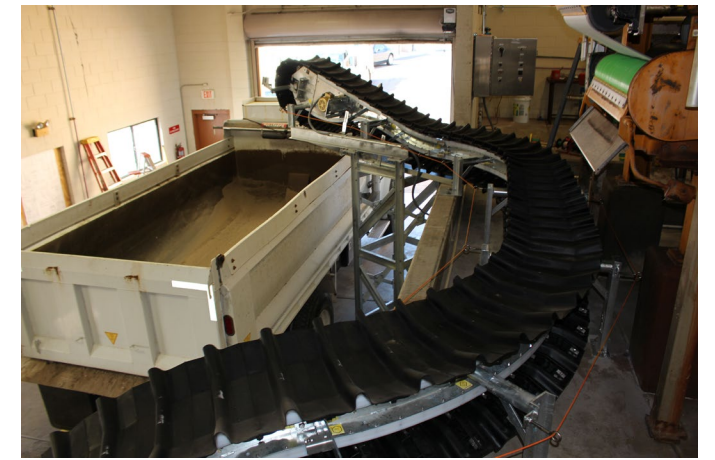




DIRECT DEPOSIT

DUMPSTER - VEYOR

BELT CONVEYORS

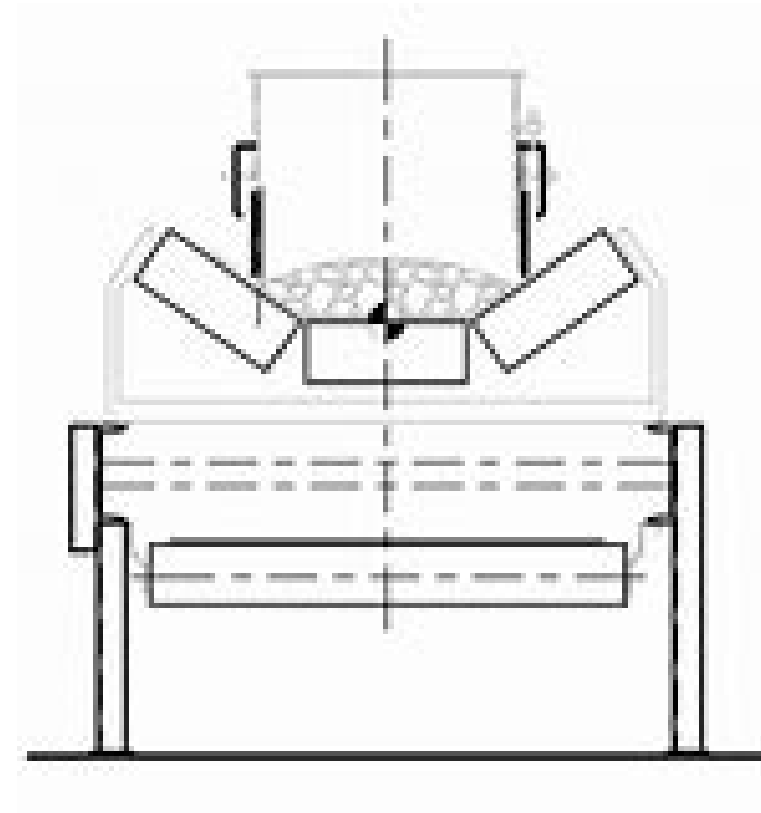


- Two Main Types
 - Troughed Belt
 - Serpentine



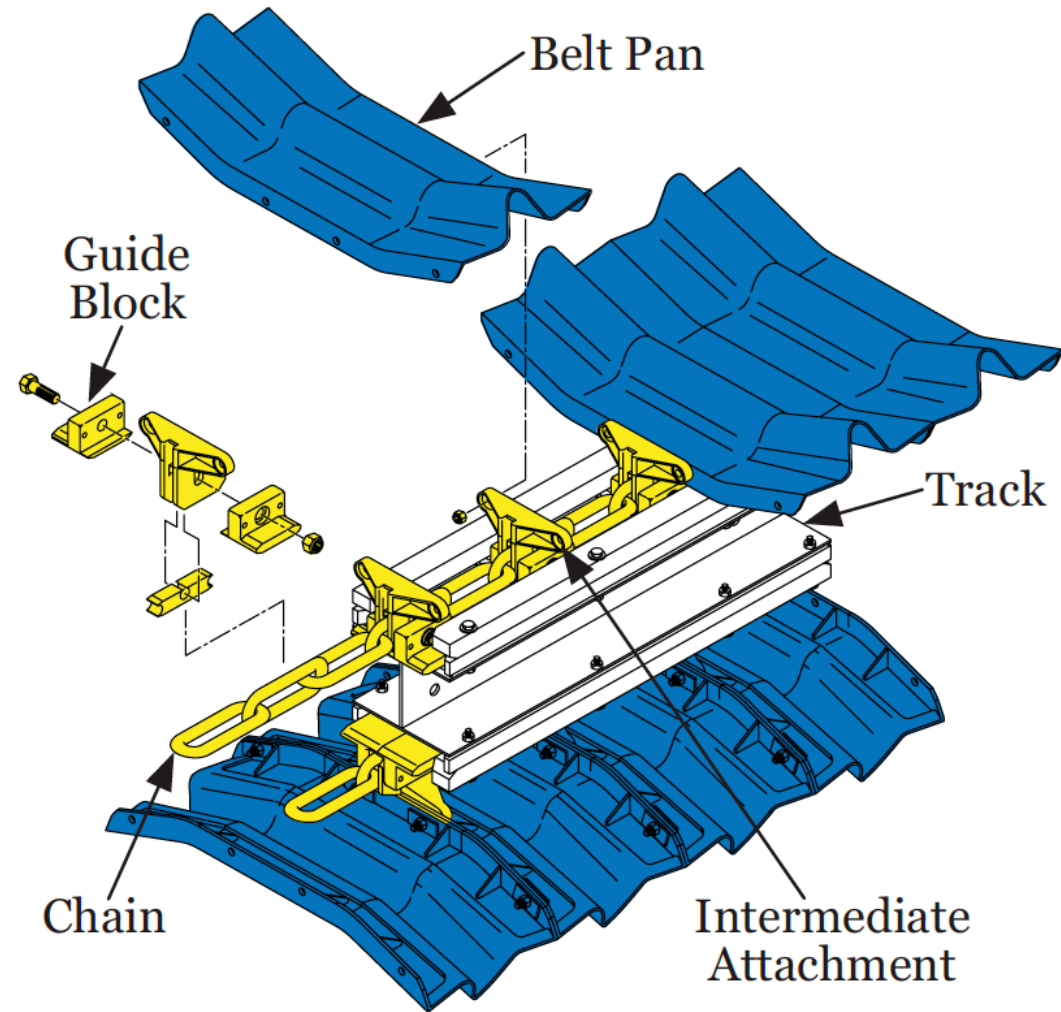
TROUGHED BELT CONVEYOR COMPONENTS

- Belts
- Rollers
- Skirts
- Frame
- Drive



SERPENTIX CONVEYOR COMPONENTS

- Belt Pan
- Track
- Guides
- Drive Chain
- Drive



CONVEYORS - DISCUSSION

Belt

- Simple
- Supports Multiple Discharge Points
- Limited Directional Ability
- Can be Messy
- Limited Outdoors
- Difficult to Control Odors

Serpentix

- Unique
- Single Discharge Point – Optional Flex End
- Directional Flexibility
- Can be Messy
- Limited Outdoors
- Difficult to Control Odors
- More Costly than a Belt



CONVEYOR DESIGN CONSIDERATIONS

- Automated or Manual Plows
- Materials of Construction
 - Costs
- Safety
 - Emergency Stop Controls
 - Cages/Belt Guards



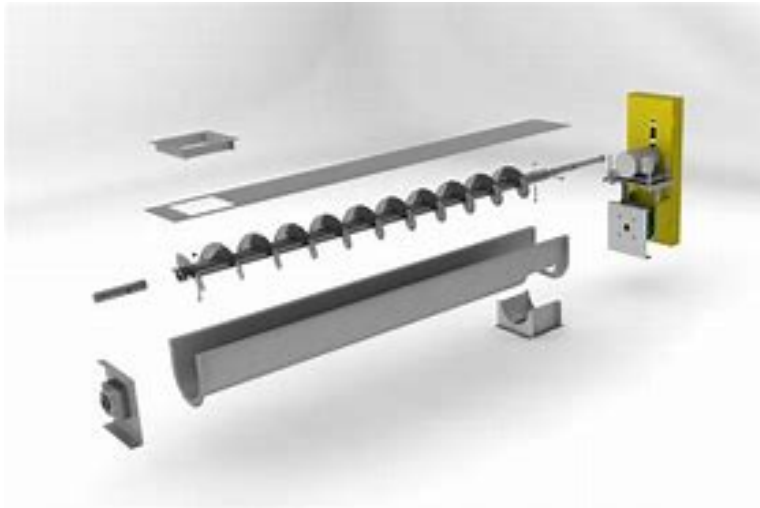
SCREW CONVEYORS TYPES

- Shafted
- Shaftless - Spiral

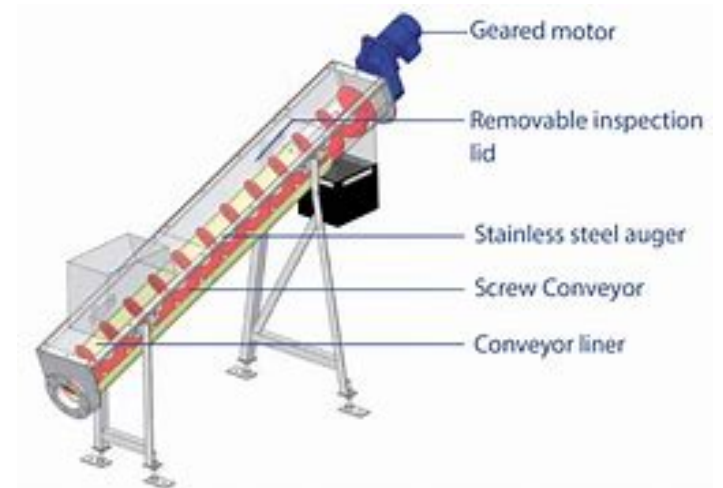


MAIN COMPONENTS

Shafted



Shaftless



SCREW CONVEYORS DISCUSSION

Shafted

- Achieve Longer Lengths
- Need Hanger Bearings
- Lower Fill Rates
- Slightly Greater Costs

Shaftless

- Can be limited in Length
- Higher Fill Rates
- Requires Liner – More Maintenance
- Can go Vertical
- Slightly Less Cost



SCREW CONVEYORS DESIGN CONSIDERATIONS

- Feed & Discharge
 - Multiple Discharge Locations – Open at End
 - Automatic or Manual Discharge Gates
 - Distances & Vertical may Change Sludge Consistency



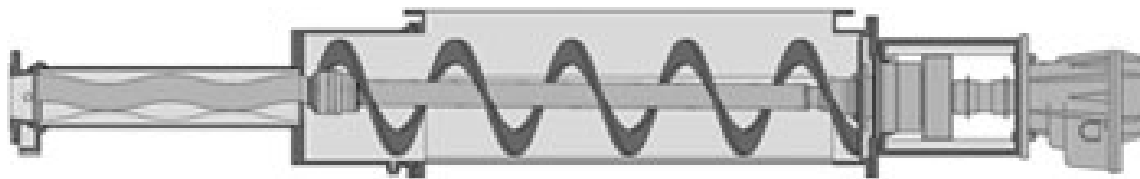
PROGRESSIVE CAVITY PUMPS

- SEEPEX, MOYNO, NETSCH
- All have Moved into this Market over the Past Ten Years
- Allows Flexibility
 - Less Space
 - Cleaner
 - Odors Contained



PROGRESSIVE CAVITY PUMPS

- Need to Feed the Material into the Pump Cavity – Rotor/Stator Area
- No Restrictions in the Pump to Increase Backpressure





PROGRESSIVE CAVITY PUMPS SYSTEM COMPONENTS



PROGRESSIVE CAVITY PUMPS DISCUSSION

- Design – More Technical
- Pressure Limitations
 - Injection Rings
- Frequency of Use
 - Cleanout Required



PROGRESSIVE CAVITY PUMPS DESIGN CONSIDERATIONS

- Distance – Pipe Sizing
 - 1 psi/Ft – Large Pipe Less Pressure
 - How do I calculate?
- Material Consistency
- Control of Feed Hopper
 - Level
 - Weight
- Frequency of Use



CAKE PUMPS

- Origins in Concrete Industry
- Available in Multiple Orientations
- Operate Under Hydraulic Pressure so Require Hydraulic Power Pack and Hoses
- Can Create Pressures up to 2,000 psi at Flows up to 300 gpm



CAKE PUMPS OPERATION

- Cake Dumps into Hopper
 - Hopper Typically Covered to Mitigate Odors
- Hopper Screws Feed Cake into Transition Chamber
- Pump has two Hydraulic Pistons to Achieve Smoother Flow
- Pistons Connect Between Transition Chamber and Discharge
- Pistons Operate in Opposite Directions
- Retracting Piston Draws Cake out of Transition Chamber, Extending Piston Pushes Cake into Pump Discharge



CAKE PUMP DIFFERENCES

- Two Main Cake Pump Suppliers in US: Putzmeister and Schwing
- Main Difference is Method of Changing over Connection to Discharge Pipe for Extending Piston
- Schwing System has Four Open/Close Valves, One on Each Retracting and Each Extending Piston
- Putzmeister has S-Tube Swinging between Pump Discharge and Each Extending Piston



CAKE PUMPS DESIGN CONSIDERATION

- Injection Ring Lubrication System – A Must!
- High Pressure Hydraulic Fluid Lines Require Support
- Require High Pressure Pipe, Fittings and Valve Actuators.
Actuators can be Electric or Hydraulic



BATTLE CREEK, MICHIGAN

- Combination of Solutions
 - Short Screw Conveyors to Feed Cake Pumps

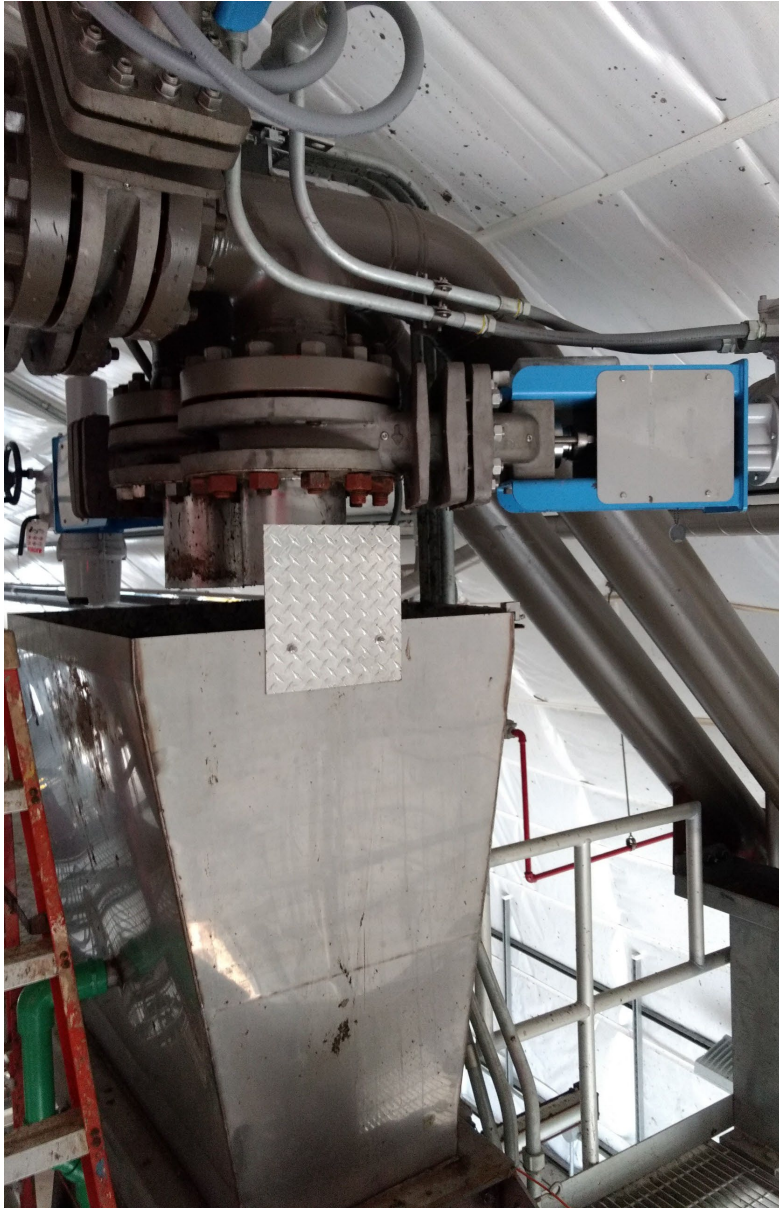




BATTLE CREEK, MICHIGAN

- Cake Pumps





BATTLE CREEK, MICHIGAN

DISCHARGE SCREWS TO TRUCKS



