S5x Trommel Plant

S5x has a Total Rated capacity in US tons per hour of, 75-125 (Cubic meters 38-63)

PERSONNEL SAFETY

GENERAL

This portion of the instruction manual is intended to illustrate only basic safety procedures. The information in this manual is not intended to replace safety codes, insurance requirements, federal, state and local laws, rules and regulations. These sections are presented as a helpful guide and show some of the daily problems that may be encountered.

STOP ACCIDENTS BEFORE THEY STOP YOU

In order to alert you, as operators and maintenance personnel, dangerous or hazardous operations are shown in this instruction manual with **BOLD and ITALIC** notes. Study this manual, the quick reference guide and any other manufacturer's literature covering your specific equipment. READ ALL WARNING INSTRUCTIONS. Practice safe operation.

KNOW YOUR EMPLOYER'S SAFETY PROGRAM!

Company safety records show that the greatest percentage of accidents is caused by disregard of simple safety rules. Consult your supervisor for specific instructions when starting a job.

DRESS PROPERLY FOR THE JOB

Protective clothing is essential to protecting one's self. Be aware that loose clothing can become entangled in moving parts! Keep warm without restricting movement. Wrist watches, rings, and other jewelry can be dangerous. Keep your pockets free of objects that may fall out. Proper clothing is required while running this machine:

1. **HARD HAT**
2. **SAFETY EYE WEAR (Glasses or goggles)**
3. **SAFETY SHOES**
4. **EAR PLUGS**
5. **RESPIRATOR (When required)**
6. **GLOVES**
7. **PROTECTIVE CLOTHING**

Other safety equipment may be required for maintenance of this machine. Find out what items are required and wear them!

READ THE MANUAL AND UNDERSTAND YOUR MACHINERY

Have everyone READ THE MANUAL (and all related literature) furnished with your equipment to learn its operating and maintenance characteristics, capacities, and limitations. Learn the location and function of ALL CONTROLS, indicators, warning devices and WARNING instructions.

READ and OBSERVE the SAFETY DECALS! Replace the decals when it becomes necessary.

ARE YOU PREPARED FOR EMERGENCIES?

Know the location of, and how to use a fire extinguisher and a first aid kit. Know where to get prompt assistance. An emergency calls for fast action.

BEFORE STARTING CHECK

Equipment not properly maintained and prepared for operation is unsafe equipment. Perform a careful check at the beginning of your shift. WALK COMPLETELY AROUND THE MACHINERY AND INSPECT IT. Check for warning and lockout tags! If something needs attention now, do not run the machinery until it is fixed. Do not let unauthorized personnel operate the Machine! DO NOT START THE MACHINE WITH FEED MATERIAL INSIDE THE MACHINE!

1. Walk completely around the machine.
2. Be absolutely ensure that no one is in, on, under, next to, or near the Machine!
3. Look for lockout tags, warning tags, and notices. Observe all safety decals on the Machine.
4. Warn all nearby personnel that you are going to start the Machine!

IMMEDIATELY AFTER STARTING CHECK

1. Check all instruments and gauges to be sure everything is operating properly.
2. Test all controls for proper functioning.
3. Listen for any unusual noises or vibrations.

DURING OPERATION

- NEVER STAND ANY CLOSER THAN FIVE (5) FEET (1.5 meters) FROM THE MACHINE WHEN IT IS RUNNING!
- NEVER LOOK IN THE FEED HOPPER WHILE THE MACHINE IS RUNNING.

STOPPING SAFELY

Be sure the Machine is stopped before:

- Cleaning
- Servicing
- Lubricating
- Checking belt tension
- Opening inspection covers
- Adjusting Machine setting
- Making repairs
- Attempting to clear a plugged Machine

MAKE NO CHECKS, ADJUSTMENTS OR REPAIRS OF ANY KIND WHILE MACHINE IS IN OPERATION!

LOCKOUT ELECTRICAL SERVICE

1. ALL MAINTENANCE PERSONNEL MUST BE PROVIDED WITH A PERSONAL PADLOCK WITH **ONLY ONE (1) KEY**.
2. Always lockout all electrical controls before performing any type of maintenance work on the Machine.

WARNING TAGS

Before working inside a Machine, be sure to tag and lockout the electrical controls, so no one else can start it. Attach warning tags to prevent accidents:

- If the Machine is unsafe for operation
- If controls are being serviced or replaced
- If the machine is being repaired

USE OF EPOXY RESINS

In those areas where epoxy materials/compounds are used, care should be taken when using a cutting torch or when grinding. THE AREA SHOULD BE WELL VENTILATED BECAUSE EPOXY FUMES CAN CAUSE NAUSEA OR POSSIBLE EYE OR SKIN IRRITATION.

ALCOHOLIC BEVERAGES AND MEDICATION

- DO NOT use alcoholic beverages before coming to work or while on the job.
- BEWARE of medicines, tranquilizers or other drugs that can make you sleepy or less alert.

WORK AREA

1. KEEP the floor clean and dry and free of debris and tools. Oily and wet floors, steps and handrails are slippery. In winter, watch out for ice and snow. Wet spots, especially near electrical equipment, are dangerous.
2. DO NOT let material lie or build up on or around the Machine.
3. STORE dangerous fluids in a suitable place - Away from unauthorized personnel. ALLOW NO SMOKING IN THE AREA! Use only nonflammable solutions for cleaning.
4. NEVER start a diesel or gasoline engine within an enclosed area unless there is adequate ventilation. Exhaust fumes can kill!

EQUIPMENT

1. Use the proper tools. Handle tools and heavy parts sensibly.
2. Keep all tools and equipment free of dirt, oil and grease. Do not drop or toss them.
3. Use hoisting equipment for heavy lifting. Save your back.
4. Lower parts. Do not drop them.
5. To prevent slipping, wipe hand levers and knobs clean of oil or grease.
6. Do not use sheaves with rims or spokes that are cracked.
7. Check for missing, cracked or frayed V-belts.
8. Check for broken, defective, worn or missing parts and replace them.
9. When using cables to move a load, be sure the cables are of adequate size. Replace any worn, badly frayed, broken or kinked ones. Check end connections for wear.

FIRE HAZARDS

1. DO NOT SMOKE while refueling — or when handling fuel containers
2. DO NOT SMOKE while using cleaning solvents.
3. WHEN pouring fuel into the tank, ground the funnel or spout against the filter neck to avoid static electric spark.
4. DO NOT use gasoline or diesel fuel for cleaning parts. Good commercial, non-flammable solvents are preferred.
5. SHUT OFF engine when refueling — and use extra caution if engine is hot.
6. DO NOT let greasy, oily rags accumulate in a poorly ventilated area. Store oily rags and other combustible material in a safe place.
7. NEVER use an open flame to check fuel, battery electrolyte or coolant levels — or to look for hydraulic leaks anywhere on the equipment. Use a sealed flashlight!
8. KNOW where fire extinguishers are kept —and how they operate — and for what type of fire. Check regularly — at least monthly — to be sure they are in the working area.

PRESSURIZED SYSTEMS - HYDRAULIC OR AIR

- Relieve ALL pressure before opening or removing any hydraulic or air pressure lines, valves, fittings, etc.
- Check for worn hoses or damaged lines.
- High pressure oil can be dangerous!

USE QUALITY PARTS

A replacement part for any item should always be of comparable SIZE, TYPE AND QUALITY — as the part being discarded. USE GENUINE FACTORY PARTS.

REPORT NECESSARY REPAIRS

- If your daily check uncovers any item that needs attention — repair, replacement or adjustment — REPORT IT
- NOW! The most minor defect could result in more serious trouble — IF THE MACHINE IS OPERATED.
- Only perform the work you're AUTHORIZED to do.
- Only work on equipment you THOROUGHLY understand.

PLANT SAFETY

GENERAL

The safety procedures mentioned in this manual do not eliminate all safety hazards found in the area of crushing plants. Trio welcomes inquiries regarding other suggested safety procedures for use around their Machines and related equipment.

DRIVE GUARDS

Proper safety precautions start with the initial installation of the Machine. Machines are driven by V-belts or by direct couplings to electric motors or diesel engines. THE BELT DRIVE OR COUPLING SHOULD HAVE A GUARD AROUND IT.

Since the speed of the Machine is quite important for proper operation, most V-belt drive guards usually have a small opening immediately opposite the center of the Machine drive shaft so that a tachometer can be inserted to occasionally check the speed. This opening should be covered with an access door.

OPERATOR'S PLATFORM

Since periodic inspection and maintenance must be performed on each Machine, IT IS IMPORTANT THAT SOME TYPE OF PLATFORM BE ERECTED AT A LEVEL CONVENIENT FOR MAINTENANCE PERSONNEL WHO MUST INSPECT AND WORK ON THE MACHINE. Do not fasten the operator's platform to the Machine

ELECTRICAL LOCKOUT

THE ELECTRICAL POWER SOURCE FOR THE CRUSHING EQUIPMENT SHOULD BE LOCKED OUT WHENEVER WORKING ON IT.

Each maintenance worker who normally works on a Machine should be provided with a personal padlock with only one (1) key. When working on any assembly of the Machine, use this padlock to lock out the electrical controls for t Machine. It is most important that only one key be provided for the lock, and that key must be in the pocket of the person who is working on the Machine.

CRANES

These machines, like any other type of mechanical equipment, require normal periodic maintenance. Internal par a machine should be assembled and disassembled with crane facilities that have the capability of gently and sl lifting and lowering the various parts that make up a machine. CHAIN HOISTS should be considered only as a L resort to assemble and disassemble a machine. Personnel working with cranes must know proper hand signals.

CONVEYOR BELTS

Conveyor belts leading to and from the machine should be provided with walkways ALONG SIDE the conveyor. ALWAYS PROVIDE HAND RAILS along the conveyor belt walkway.

DO NOT USE CONVEYOR BELTS AS THE WALKWAY.

CLEARING THE MACHINE

There are many events such as power failures, sudden surge of materials, etc., which can cause a machine to become plugged with material and stall. UNPLUGGING THE MACHINE CAN BECOME A VERY SERIOUS POTENTIAL SOURCE OF ACCIDENTS. PROCEED WITH CAUTION! In many instances, the only way in which the machine can be restarted is to dig the material out of the crushing cavity by hand.

GENERAL MAINTENANCE WORK

The following points cover some of the basic do's and don'ts when performing maintenance work.

1. DO NOT perform maintenance on moving machinery. This includes adding lubricating oil or greasing parts of a machine while it is in operation.
2. DO lockout and tag the equipment before performing maintenance work.
3. DO NOT look into the machine while the machine is in operation without protection.
4. DO avoid spillage around the machine. Plant operators should make it a habit to keep the area immediately adjacent to the machine free from this type of spillage which could cause unsuspecting personnel to trip and fall.

A-II GENERAL INFORMATION

INTRODUCTION

This Instruction book has been prepared to assist you, the user, in the installation, operation and maintenance of your machine. This information will serve to acquaint you with the construction of the machine and as an aid in gaining the general knowledge necessary for efficient operation and maintenance. It is strongly recommended that the contents of this book be read, understood and put in practice prior to both installation and operation of the machine.

INITIAL INSPECTION

It is recommended that as soon as possible, after receipt of the machine, a careful check be made for any possible damage which might have occurred during transit. A careful check should also be made to be sure that nothing has been lost and that all items on the Bill of Lading, Freight Bill or Manifest can be accounted for.

PARTS MANUAL

This manual also illustrates and identifies the major parts used in the assembly of the machine and is to be used when ordering spare or replacement parts.

REPAIR PARTS

For proper operation, only genuine factory parts should be installed. To avoid delay and the possibility of incorrect parts being furnished, the following information should be provided when ordering:

1. **Model Number**
2. **The Serial Number of the machine, which is stamped on the nameplate, as well as on the cover of the parts manual.**
3. **Complete name and part number as shown in the parts manual.**
4. **Exact quantity of each part ordered.**
5. **Complete shipping instructions.**

BEFORE STARTING CHECK

Equipment not properly maintained, and prepared for operation is unsafe equipment. Perform a careful check at the BEGINNING of your shift. Check for warning and lockout tags! If something needs attention now, do not run the machinery until it is fixed. Do not let unauthorized personnel operate the machine!

1. Walk completely around the machine.
2. Be absolutely certain that no one is in, on, under, next to, or near the machine!
3. Look for lockout tags, warning tags, and notices. Observe all safety decals on the machine, and related components.
4. Warn all personnel nearby that you are starting the machine!

DO NOT START THE MACHINE WITH FEED MATERIAL INSIDE THE MACHINE!

STARTING THE MACHINE

DO NOT INTRODUCE ANY FEED TO THE MACHINE BEFORE OR DURING STARTING! A typical starting procedure is as follows:

1. Start the motor and wait till machine gets stable.

A typical starting procedure for machine with **Variable Speed Motor drive** is as follows;

1. Before starting feeder motor, place controller at highest or top speed position.
2. Start the machine drive (electric motor).
3. After feeder motor has attained full speed, move controller to get desired motor speed.

DURING OPERATION

- NEVER STAND CLOSER TO THE MACHINE WHEN IT IS RUNNING!
- DO NOT LEAN OR PLACE YOUR HANDS AGAINST MACHINE WHILE IN OPERATION.

STOPPING SAFELY

STOP FEED BEFORE STOPPING MACHINE.

Be sure the machine is stopped before:

- Cleaning
- Repair and Servicing
- Checking belt tension
- Adjusting machine setting
- Lubricating
- Attempting to clear a plugged machine

MAKE NO CHECKS, ADJUSTMENTS OR REPAIRS OF ANY KIND WHILE MACHINE IS IN OPERATION!

LOCKOUT ELECTRICAL SERVICE

1. ALL MAINTENANCE PERSONNEL MUST BE PROVIDED WITH A PERSONAL PADLOCK WITH ONLY ONE KEY.
2. Always lockout all electrical controls before performing any type of maintenance work on the machine.

WARNING TAGS

Before working inside a machine, be sure to tag and lockout all electrical controls, so no one else can start it. Attach warning tags to prevent accidents:

1. If the machine is unsafe for operation.
2. If controls are being serviced or replaced.
3. If the machine is being repaired.

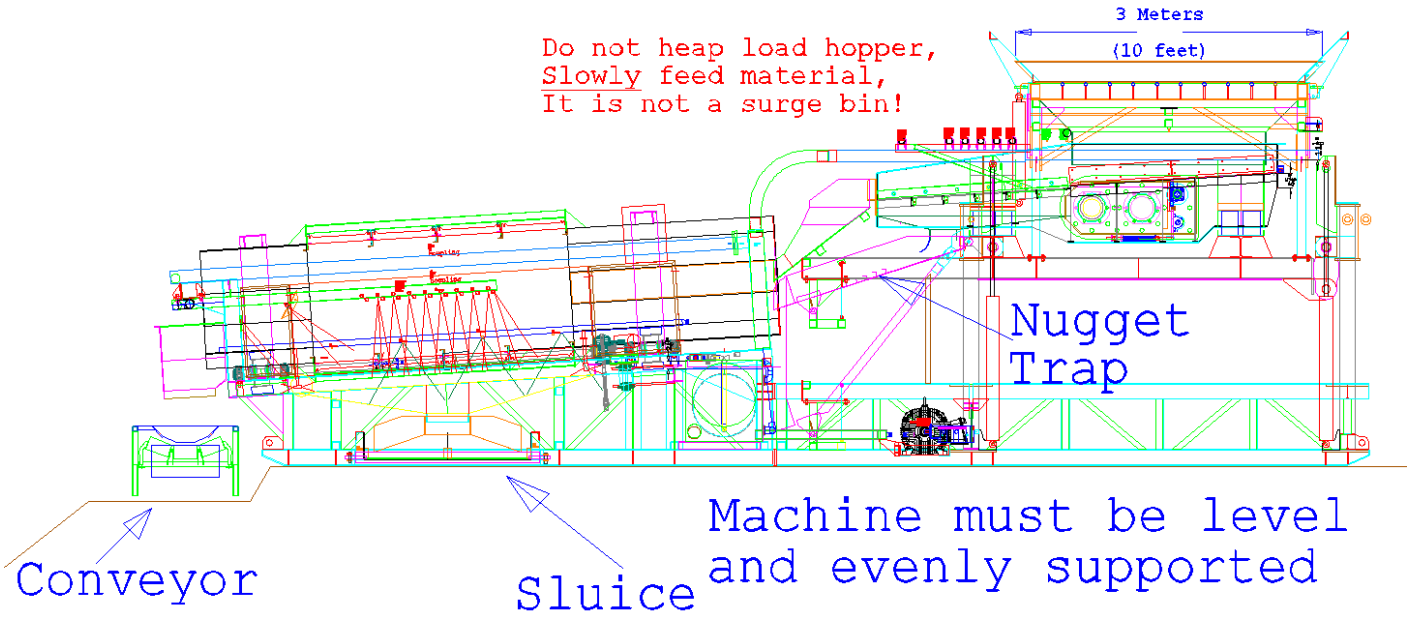
Trommel set up and maintenance

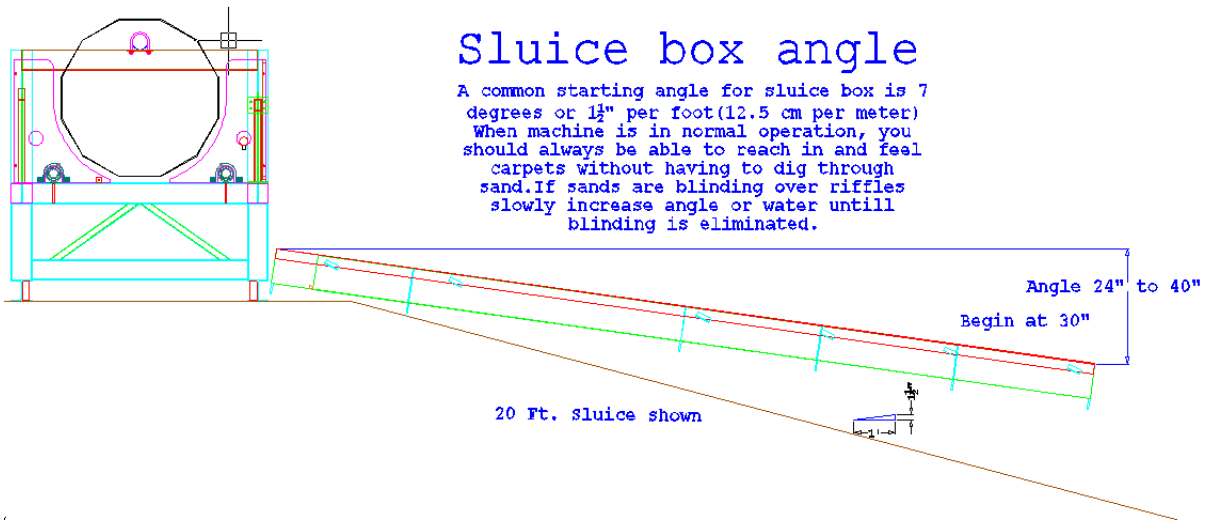
Leveling

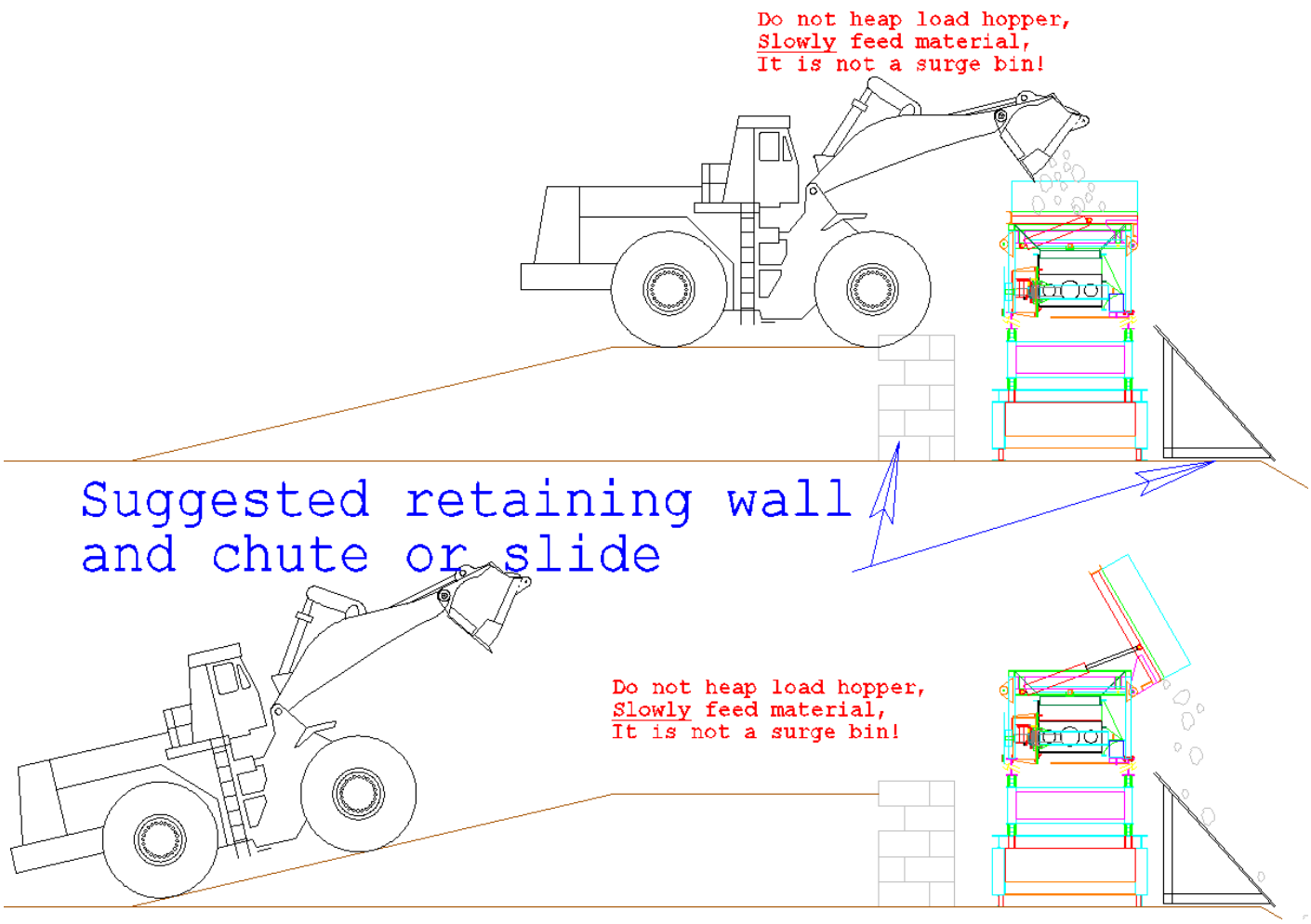
Machine must be level and <u>evenly</u> <u>supported</u>, to maintain structural integrity.

A well compacted site should be used to eliminate machine settling.

MSI recommends a 8 foot x 40 foot concrete slab for soft ground and/or long term operation







Hydraulics

Water must be turned on at all times while running Hydraulics, Water requirement through oil cooler is 100 US gallons per Minimum.

Change Hydraulic oil every 12 months or 2000 hours

Change Oil Filter monthly or every 200 hours

Use a premium quality hydraulic fluid with a viscosity range 150-300 SUS (32-65 CST) at 100 F (38 C) 45 is recommended

Normal operating viscosity range between 80-1000 SUS (16-220CST) Maximum start up viscosity should not exceed 4000 SUS. Oil should have maximum anti-wear properties, rust and oxidation inhibitors.

Oil temperature should not exceed 190 F (85 C)

Bearings

Lubricate all Bearings weekly or every 50 Hours

Trommel Tires

Inspect trommel tires weekly for damages

Gearboxes

Check oil levels in trommel gearboxes monthly, 85-90 gear oil is recommended.

Freezing conditions

Water must be drained when in freezing conditions to prevent equipment damage,

When winterizing open oil cooler drain valve to drain oil cooler

Electrical

MSI's standard input electrical requirements are 460 Volts, 3 Phase, at 60 Hertz unless otherwise noted or special ordered by customer

Water

Water requirements for The S5x with standard 60 inches of sluice width is 840 gallon per minute.

How water requirements are established, and how they can vary from mine site to mine site or from the speed of material being fed to machine.

Over many years of selling equipment, MSI has averaged the fines that will pass through the machine into the recovery system "This is what sets all water requirements" obviously this can vary

We have established as an average for most mine sites that 40% of the total material being fed will be 3/8" or smaller and if it is different, adjustments should be made to achieve the best recovery rate.

The general recovery rules:

Solids; For every 1 ton per hour of solids(3/8" or smaller) you need 1 to 1-1/2" of sluice width

Example, 100 ton per hour feeding plant, at 40% fines= 40 ton per hour in sluice system
40 x 1.5=60 inches of sluice width required, if your fines were more than this you may need to add more sluice width or slow down feed, so not to overrun sluice until adjustments can be made.

Water: for every inch of sluice width try to maintain 14 gallon per minute of water

Example; 60 inch wide sluice x 14= 840 gallon per minute of water.
As a visual reference, this would approximately 1 inch deep in a sluice sloped at 8 degrees.

There is a old saying that is true;
It is better to have too much water or have your sluice to steep than the opposite.

Water should be as clean as possible for good gold recovery, as free as possible of sediment.
Water high in sediment will cause recoveries to diminish, will cause excess wear to pumps and piping, plug and wear spray nozzles.

Carpets and cleanup

MSI recommends changing sluice carpets daily. Then feed sluice concentrates through, MSI multi process concentration jigs, then to the Xtruder table.

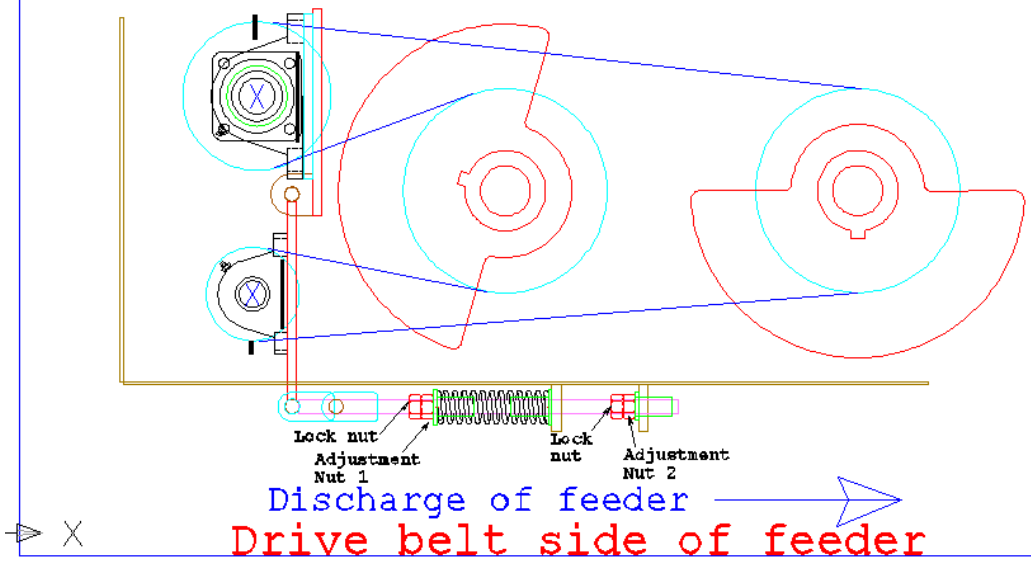
Vibratory Feeder Timing Belt

Lubrication and Inspection
Monthly or every 200 hours remove doors and lubrcate all bearings, also inspect and re-adjust drive belt.

1. BELT Replacement: Remove doors and rotate weights with wrenches provided, hold weights in place with wrenches as shown (figure 1), loosen nut 2 to loosen springs.

2. Feed belt through all sheaves starting from top, keeping belt tight and in Cogs working downward as shown.

3.Tighten Adjustment nut 1 untill it stops against internal stop(Inside of spring).
4. Tighten lock nut against adjustment nut 1.
5. Tighten adjustment nut 2 (By hand "finger tight") against rear plate.
6. Tighten lock nut against adjustment nut 2.
7. Remove weight positiong Wrench
8. Reinstall doors
9. Inspect belt monthly and re-adjust to specifications above



Machine Operation

1. Turn on main reservoir oil Valve
2. Set all control valves to 0
3. Bump check motor rotation direction (Warning; running motor without oil or incorrect direction for more than 3 seconds will cause major hydraulic pump damage)
4. Start electric motor
5. Using the 2 hydraulic handles, raise feeder to operating position, while raising keep feeder as level as possible by alternating between the 2 handles, once fully raised install pins, install wings on grizzly and remove any shipping hardware.
6. Install discharge lips on feeder discharge chute and nugget trap.
7. Install sluice and trommel discharge conveyor or chute.
8. Now ready to process ore, turn on water to machine (machine is equipped with a water cooled oil cooling system, water must be on while operating)
9. Then slowly move speed controls to operating speed,

   Note; Always use hydraulic controls to start machine, do not use electrical switch

* Trommel and feeder are designed to be operated at Maximum setting to achieve highest tonnage and optimize cascading scrubbing action in trommel. (Feeder speed may be adjusted to slow material feed rate to trommel) Operating pressures should never exceed 2500 PSI (17200 KPa) and 190 Deg. F (80 C) If pressures are high, slow feed rate until pressures and Temp. lower.

*To avoid damage to machine, a maximum rock size through feeder and trommel of 6”(150 mm) must be maintained.

*Weekly lubrication must be accomplished.

*Weekly inspection of wear plates, replace as needed.

***Housekeeping should be done daily, to prevent sand or material buildup on bearings, motor and hydraulic tank.**

Assembled unit

Pin legs after raising feeder

Install 4 bolts

Install wings and back plate

Install discharge chute and bracing

Bolts sluice sections together using silicone and bolts

Install carpets, riffles wedges

Assembly becomes directional--Water flow

Wedge locks

Flow -->

Looking at feed end, Flow is flowing away in this view

Install Trommel discharge chute

Connect power to starter panel

Installing Sluice

Install hose

Install discharge lips on chute and nugget trap after raising and before lowering feeder

Warranty

MSI "Madden Steel Inc." warrants, commencing with the date or the receipt of the goods by the first end user and for a period of one (6) months or (1000) one thousand hours whichever comes first, or from the date equipment left MSI's facility. MSI warranty provides coverage for defects in material and workmanship. If within such warranty period, any machinery or parts shall be proved to the satisfaction of MSI to be defective, it shall be replaced, or at the option of MSI, repaired at its factory, F.O.B. MSI's manufacturing plant in Brighton, Colorado at no charge (providing the defective machinery or parts are returned to MSI's manufacturing plant, freight prepaid)

MSI is wholly discharged of all liability under the forgoing warranties in the event that the purchaser of the machinery or parts fails to pay for the goods promptly and in accordance with the terms of the purchase agreement.

Inasmuch as the work to be performed by the buyer or end-user with the machinery or parts furnished by MSI will vary according to the materials used, local conditions, and the results require and that such variation will continue throughout the use of such machinery or parts, it is not possible to warrant or represent that machinery or parts furnished by it will handle specific materials or will produce specific results from such materials. Any application analysis and resultant equipment performance expectations are provided as estimates only and are not to be constructed in any manner as a production guarantee.

We do not represent that this equipment or machinery is suitable for your application.

We recommend that all critical items be independently tested and/or engineered to assure the buyer that the work, material, and equipment is suitable for your needs.

It is expressly understood that any technical advice furnished by MSI "Madden Steel Inc." and its employees with respect to the use of its goods and /or services is given without charge, and seller assumes no obligation or liability for the advice given, or results obtained. All such advice given and accepted at buyer's risk.

MSI does not warrant or represent that any machinery, parts or accessories furnished by it meet any International Territory, Country, Federal, State or Local statutes, codes, ordinances, rules, standard or other regulations covering safety, pollution, noise, electrical wiring etc.

MSI shall not be subject to any other obligations or liabilities whatsoever with respect to machine, parts, accessories, or services manufactured or furnished by it or any undertakings, acts or omissions relating thereto. Under no circumstances shall MSI be liable for any consequential or other damages, expenses, losses. There are no warranties which extend beyond the description on the face hereof.

At MSI's option, machinery or parts from and outside source that is not a designed part of a MSI machine, may be covered under this warranty, must be approved by MSI, purchaser must have this stated in writing, for the items to be covered.

The following items, not limited to this list and subject to MSI"s opinion, are <u>not</u> covered by MSI warranty:

Machinery or parts, from an outside source, that is not a designed part of a MSI machine.

Natural wear and tear of equipment, components, or parts

Normal maintenance for such things as tightening, adjustments, settings, changing of seals, engine tune-ups, and inspections or improper installation or connections (electrical, water, air, oil)

Normal aging

Normal replacement items, such as service filters, light bulbs, oil, belts, wear plates, tires, brakes, hoses and power cable

Any non-MSI supplied equipment

Machinery, parts or accessories repaired or altered by others

Components in the path of material flow (i.e. belt scrapers, rollers, etc.)

Damage due to improper application

Damage due to freezing

Damage due to improper fluids

Damage due to improper pressurization

Damage due to poor housekeeping practices

Failure to comply with local, state and federal or International regulations that effect the proper operation of MSI equipment

Equipment downtime or loss of production

Outside safety inspection or any change requirements

Acts of nature such as lighting strikes, wind, floods, fire Etc...

Shipping, transport or mishandling damage

Shipping charges

Any damage sustained by any of the above items