

**OPERATIONS AND  
MAINTENANCE PLAN**

**H<sub>2</sub>PRO WATER INJECTION SYSTEM  
AND  
CASCADE “ZERO BLEED”**

**Scrap, Inc.  
1751 North Green Street  
Pensacola, Florida**

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## TABLE OF CONTENTS

1.0	Introduction .....	1
2.0	Setting Controls – Cascade System .....	1
3.0	Setting Controls – H <sub>2</sub> PRO Water System .....	2
4.0	Startup and Shutdown .....	3
5.0	Inspections and Maintenance .....	3
6.0	Troubleshooting .....	6

### APPENDICES

Appendix A – Cascade System – General Operating Instructions

Appendix B – H<sub>2</sub>PRO Water System Manual

## 1.0 Introduction

This Operation and Maintenance Plan was prepared for the Scrap, Inc. metal shredding facility located at 1751 North Green Street, Pensacola, Escambia County, Florida. The facility includes a 4000 HP electric shredder that has the potential to process up to 360,000 tons/year, and a Cascade "Zero Bleed" air classifier. Particulate emissions from the shredder are suppressed by an integrated, electronically controlled H<sub>2</sub>PRO Water Injection System. This equipment will be operated in accordance with the requirements of Florida Department of Environmental Protection Air Permit No 03300284-001-AC

## 2.0 Setting Controls – Cascade System

The following sections provide information on specific controls of the Cascade System manufactured by Osborn Engineering. Refer to General Operating Instructions in Appendix A.

### 2.1 Bleed Off Control

Location: At fan discharge.

Type: Variable air volume for discharge to atmosphere

Purpose: To minimize leakage of air at discharge of cascade, to relieve heat and dust buildup.

Actuator: Manual – set at approximately 50% open at startup.

Adjustment Required Due To:

1. Extreme weather changes
2. Wearing our of rubber flaps

Optimum Setting Determined By:

Visual inspection of "blow-out" at cascade discharge.

1. Setting too little bleed-off will cause "blow out" at cascade discharge.
2. Setting too much bleed-off will cause accumulation of fine particulate to atmosphere which may be excessive and may cause lack of necessary air for cleaning.

When to Set: With fan running and no shredded product.

### 2.2 Bypass Control

Location: At fan discharge.

Type: Variable air volume for bypassing cascade.

Purpose: For control of cleaning efficiency through cascade by metering air through a parallel duct. This allows cyclone to maintain constant

volume (equaling constant efficiency), which dampening of air would not allow, while allowing variable velocity through the cascade cleaning section. This, in turn, allows for "cut point" to be adjusted by operator.

Actuator: Manual – set at approximately 50% open at startup.

Adjustment Require Due to:

1. Weather changes (e.g. wet or dry)
2. Change in input feed stock
3. change in moisture input
4. Change in process rate.

Optimum Setting Determine by:

Visual inspection of quality of non-ferrous finished product with relation to metal "contaminant" of waste pile. There is a "grey area" in which operator will be required to make the final adjustment, a judgment call determined by the basis of maximum importance of the following:

- (A) Is there too much dirt in the non-ferrous finished product, or
- (B) Is there too much non-ferrous carryover in the dirt pile?

If (A) is positive, bypass is reduced to allow more air through the cascade.

If (B) is positive, bypass is increased to allow less air throughout he cascade.

Optimum setting is a balance between A and B.

When to Set: During normal production.

### 3.0 Setting Controls – H<sub>2</sub>PRO Water System

Refer to Riverside Engineering, Inc. Operations Plan in Appendix B.

Location: In control tower.

Type: Variable water volume

Purpose: To suppress dust and hydrocarbon emissions at mill in-feed area. To minimize explosion potential by lowering temperature in mill and extinguishing sparks, etc.

Actuator - Auto: Electrical potentiometer at shredder operator control console. Adjusts water flow based on shredder motor load – see below for settings.

Actuator – Manual: Used to adjust water flow for:

1. Wet/dry weather conditions.

2. Input feed stock (more water required with flammable materials (autos vs. white goods)).

Optimum Setting Determined By:

1. Addition of water when excessive smoke generated at shredder in-feed area.
2. Reduction of water when transfer conveyor and shredded material becomes saturated.

When to Set: During normal operation.

At system startup, the following parameters were set for Auto mode:

1. Water Flow - minimum water flow through the suppression system set at 0 gallons per minute; maximum water flow was set at 36 gallons per minute
2. Proportional valve – minimum amperage set at 800 amps; maximum amperage set at 4,600 amps
3. Bias – minimum valve stroke set at 15%; maximum valve stroke set at 70%
4. Dwell set at 1500 ms

#### **4.0 Startup and Shutdown**

The water suppression system will be engaged prior to commencing shredding operations to ensure proper operation of the water suppression system. Once a load is placed on the shredder drive motor, the water suppression system is automatically engaged and the optimum water flow rate is set based on the shredder motor output. The water suppression system is automatically disengaged once the shredder motor output is at a zero load.

#### **5.0 Inspections and Maintenance**

##### **5.1 Cascade System**

Certain areas inside the cascade cleaning system will require daily cleaning due to dirt buildup. Other areas will require periodic inspection to determine if sufficient abrasion has occurred to necessitate replacement or repair of that part. Still other areas require inspection of or maintenance.

##### **5.1.1 Daily:**

- Remove debris from internal surfaces of horizontal inlet duct, cyclone inlet transition, and ledge on cyclone inlet scroll. These areas tend to build up with loose dirt and light metals, sometimes up to a depth of 12 inches. If scooped off into cyclone center daily the buildup is easily and quickly taken care of. If allowed to accumulate for a number of days, then this material will become hard packed and difficult to remove.
- Remove dirt from internal top surface and center tube of cyclone.

- Inspect fan discharge chute with diverter gate. The lead edge of the diverter gate will cause airborne rags and stringy material to hang up, requiring daily removal. Failure to remove waste may cause gate to become wedged. Also, the discharge chute entry into cascade area will require daily removal of relatively large pieces of shredded metal. These pieces are usually coil springs which tend to bounce for the opposite side of the cascade cleaning section into the chute area.
- Inspect all fan bearings and shaft bearings for proper lubrications.
- Inspect rotary valve rubber flaps daily to insure that damage is not causing air leakage, in turn causing re-entrainment of dirt in air stream. Easy visual check by watching light dust to see if it is drawn upward by any "vacuum leak" on discharge side of valve. This may only require cleaning

#### 5.1.2 Bi-Weekly

- Internal surface of cone – a dirt "ridge" will build up with wet materials becoming quickly hard packed. Inspect every 2 to 3 days – scrape off to remove.

#### 5.1.3 Weekly

- Fan wheel – inspect blades weekly for dirt buildup. Moderate buildup will cause wheel to become unbalanced which could cause bearing and/or shaft damage.

#### 5.1.4 Monthly

- Abrasive resistant liners in the cascade are bolted in and should be replaced before worn through to external housing material.
- Discharge flaps on cascade cleaning chamber will eventually become "ragged". Replace when necessary.
- Inlet air gate rubber flaps will become worn. These flaps should be replaced when necessary.
- 90 degree elbow inlet duct with bolt on back plates require monthly inspection for replacement.
- The abrasive resistant plate welded in the cyclone inlet scroll may require infrequent repair. Since this is a very large shape, repair by patching areas with new AR steel, by welding.
- Rotary valve flaps may require replacement (as previously described).
- All other rubber flaps and seals may periodically require replacement.
- V-Belt Drive: Using tachometer, check fan RPM to insure fan is turning the correct speed. If belts are slipping, the speed of fan will be slower

than original. If slipping, tighten per V-Belt drive manufacturer's instructions.

- **Magnehelic Gauges:** The gauges furnished are very accurate when new. But, when liquid and dust are allowed to enter through the vacuum tubes, they quickly become useless. Install the tubing and fittings permanently as required, but leave the gauges un-mounted, so they can be kept inside in a cleaner environment. Bring out the gauges only when necessary and then treat them as a hand held instrument.

## 5.2 H<sub>2</sub>PRO Water System

### 5.2.1 Daily

- Inspect air and water piping – examine for leaks in any junctions or fittings.
- Drain condensation from air regulator collection bulb to prevent corrosion of components in the air system.
- Inspect regulators when the system is operating to make sure pressure is sufficient for proper operation.
  - 90 – 100 pounds per square inch (psi) for proportional valve.
  - 12 – 25 psi for air through water nozzles.
- Inspect nozzles to prevent debris from building up within the shredder box.
  - Water pressure needs to be 65 – 95 psi for the required flow into the shredder box.

### 5.2.2 Weekly

- Inspect nylon inserts inside the water nozzles to make sure that they are present and clean.
- Inspect lines that feed the nozzles. Examine the lines for any cuts or abrasions that might impair proper operation of the system.
- Inspect and clean the filter on the air system for the proportional valve.

### 5.2.3 Quarterly

- Inspect and calibrate the proportional valve to make sure it has a proper stroke.
  - Remove valve from manifold and inspect the gasket on the cone to make sure it is pliable and there are no deformations to the seal.
  - Inspect the seat from which the valve was removed to make sure there is not any build up of corrossions or foreign objects.
  - Check operation of the valve:
    - Give a 0% command from the operators touch screen and make sure the valve is fully extended.

- Give a 100% command and make sure the valve is fully retracted.
  - When the stroke of the valve has finished a Green light on the top of the valve should illuminate.
  - If the stroke of the valve does not either fully extend or retract, contact the Manufacturer.
  - Red light on top of the valve indicated it has power and is ready for operation.
- Check calibration of water meter:
    - Fill a 55-gallon drum (or comparable container of known volume) and document time required for container to fill. Calculate the flow rate.
    - Repeat procedure a minimum of three times and take average flow rate.
    - If the average flow rate differs from the meter reading by more than 5%, contact the Manufacturer.

## **6.0 Troubleshooting**

### **6.1 Cascade System**

#### **6.1.1 Ferrous Product Dirty:**

- A. Too much bypass air.
- B. Too much bleed off air.
- C. Too much water.
- D. Fan not operating correctly (belts slipping, out of phase, etc.)
- E. Air system leaking or partially plugged.

#### **6.1.2 Non-Ferrous dirty:**

- A. Same as ferrous dirty.

#### **6.1.3 Excessive Particulate Discharge from Bleed-Off Stack"**

- A. Not enough water in mill.
- B. Rotary valve flaps or surge hopper doors leaking, causing re-entrainment of dust in air stream.
- C. Excessive fluff in feed stock.

#### **6.1.4 Blow Out of Air at bottom of Cascade**

- A. Not enough bleed off air.

- B. Leakage of air anywhere in system from top of cascade to fan inlet.
- C. Buildup of material in bleed off stack.

6.1.5 Excessive Metal in Waste:

- A. Not enough bypass air.

6.2 Troubleshooting – H<sub>2</sub>PRO Water System

Refer to Operations Manual in Appendix B