Team Scrap Reclamation

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Background Information

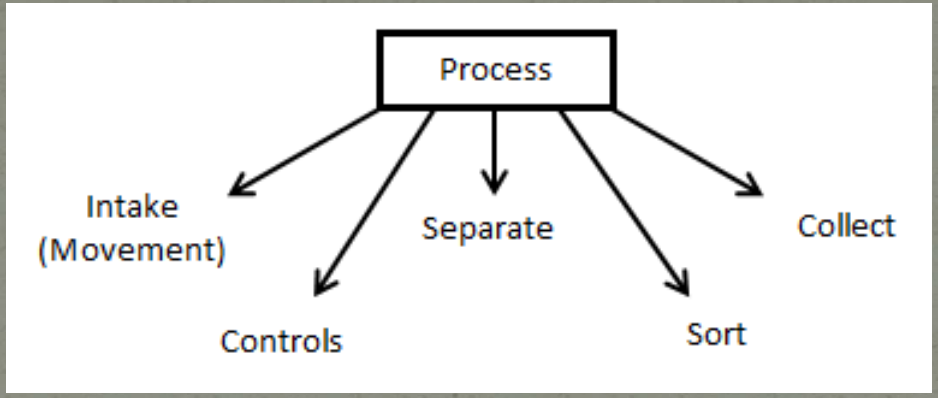
- General Cable produces Ethernet cable
  - Primary
  - Twinned
  - Bunched
- Estimated Potential Scrap – 3700 lbs/month
- Reclaim
  - Insulated
    - Copper – $3.23/lb
    - FEP insulation – $0.40/lb
  - Clean
    - Copper - $3.26/lb (fluctuates)
    - FEP insulation- $1.70/lb

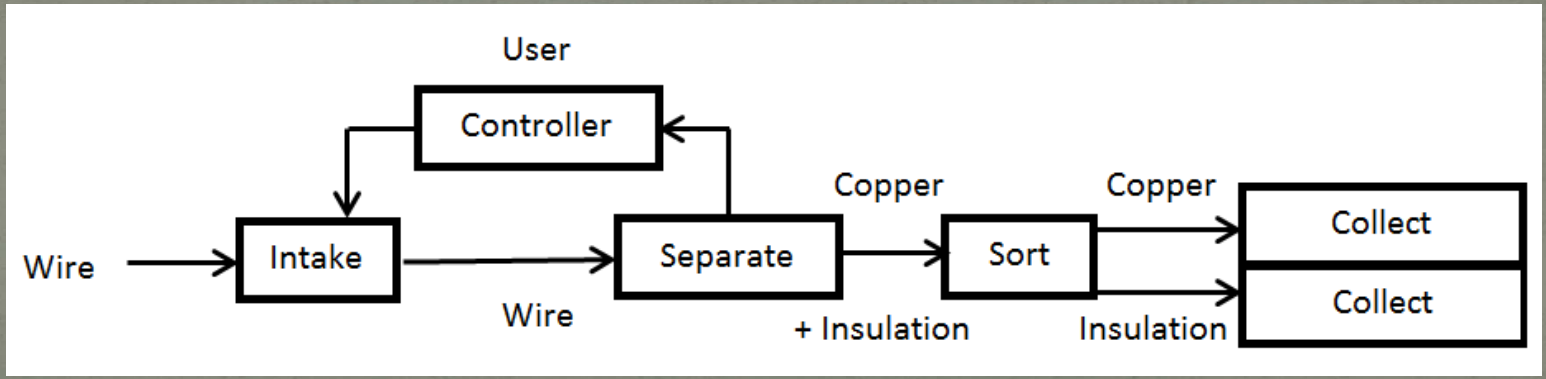
Current Splitter

Problem Statement

- Develop and prove a concept that automatically separates copper and FEP insulation from scrap twinned wire material.

Process Breakdown & Terminology





Separation Candidates

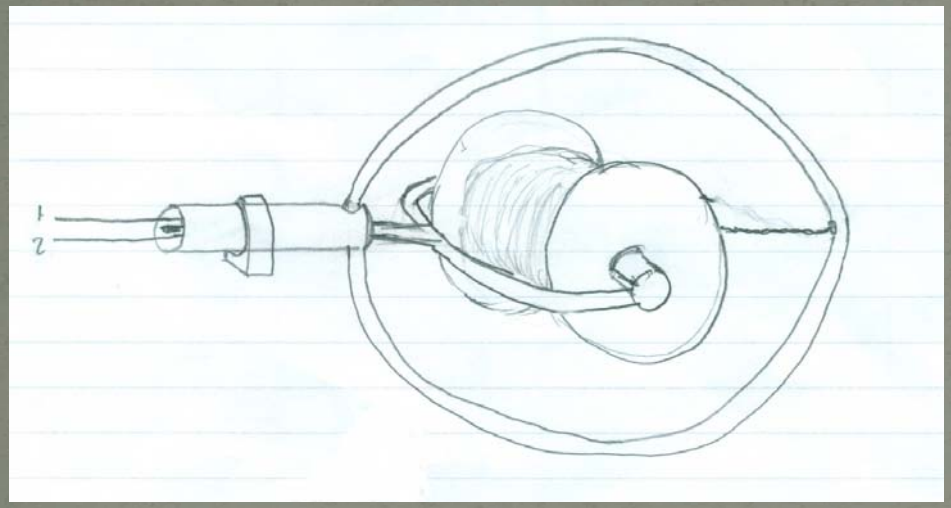
Grinder

- Theoretically, works equally well with all types of wire
- Multiple reels to increase net throughput

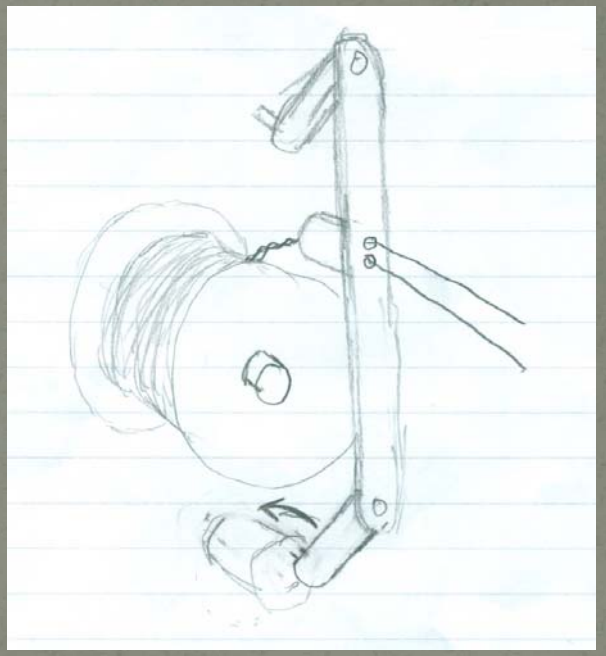
Roller/ Modified Roller

- Proven method
- Limitation
  - Primary only

Untwinner Designs



Bow Method

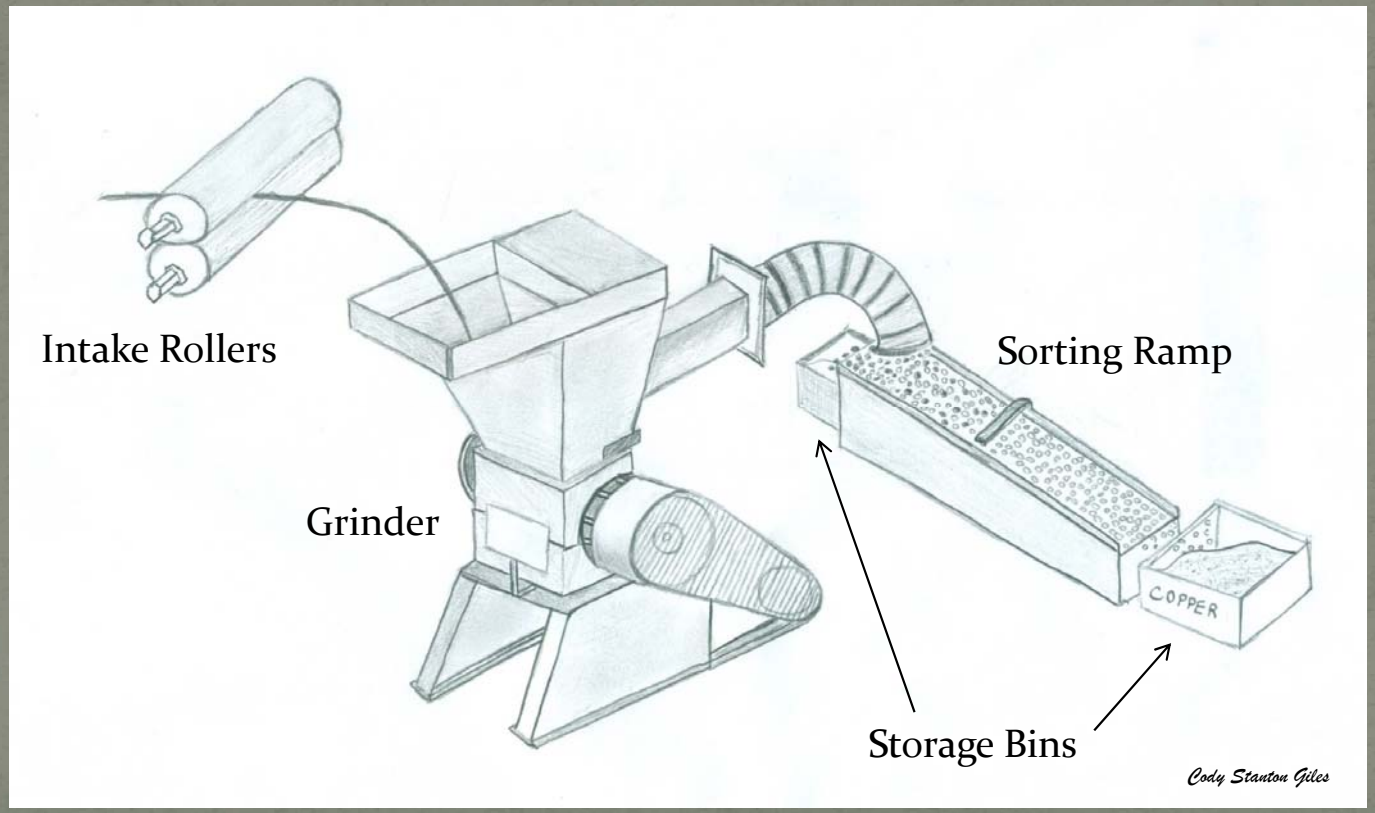


Off-the-End Method

Using Density to Sort

- Specific Gravity
  - Copper = 8.89
  - FEP insulation = 2.15
- Buoyancy
  - In a fluid with a density between these two, copper will sink while FEP will float
- Aerodynamics
  - A stream of moving air will have a greater effect on insulation because it is lighter

“Bit Blower” Conceptual Design



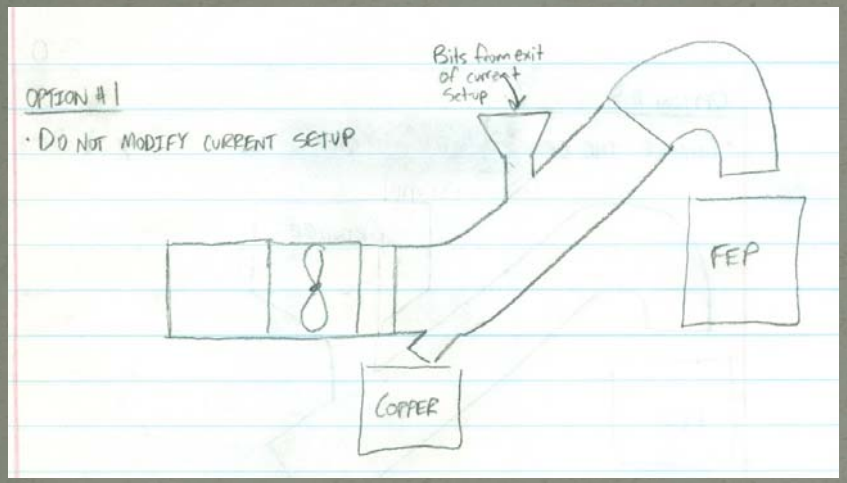
Current Grinder Setup

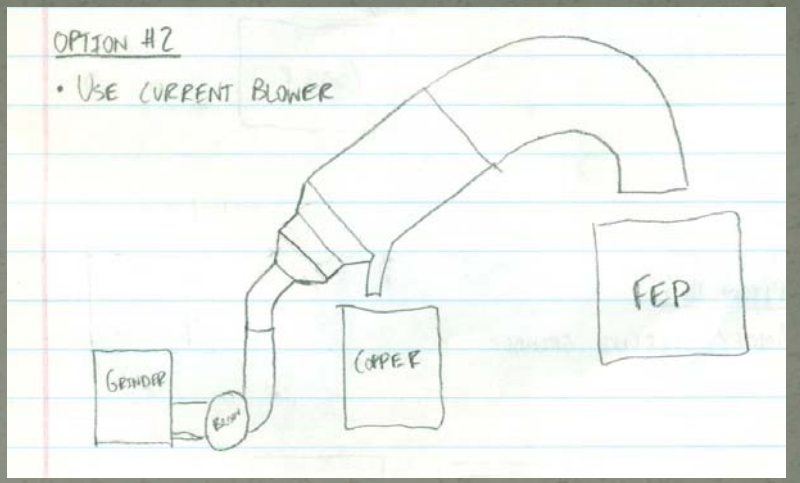
Grinder Only

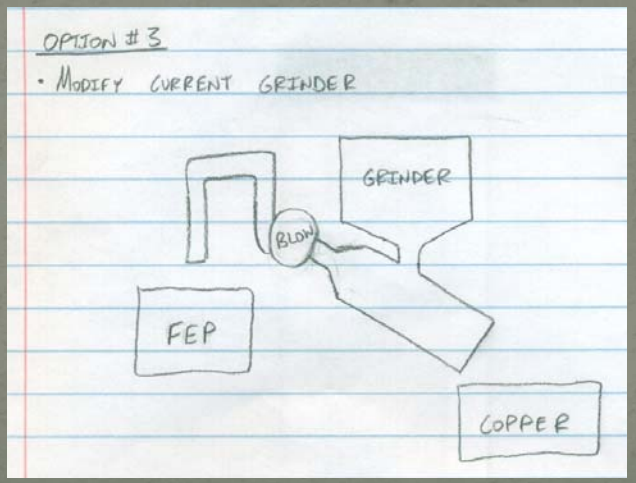
Splitter + Grinder

Model Video

Going Full Scale



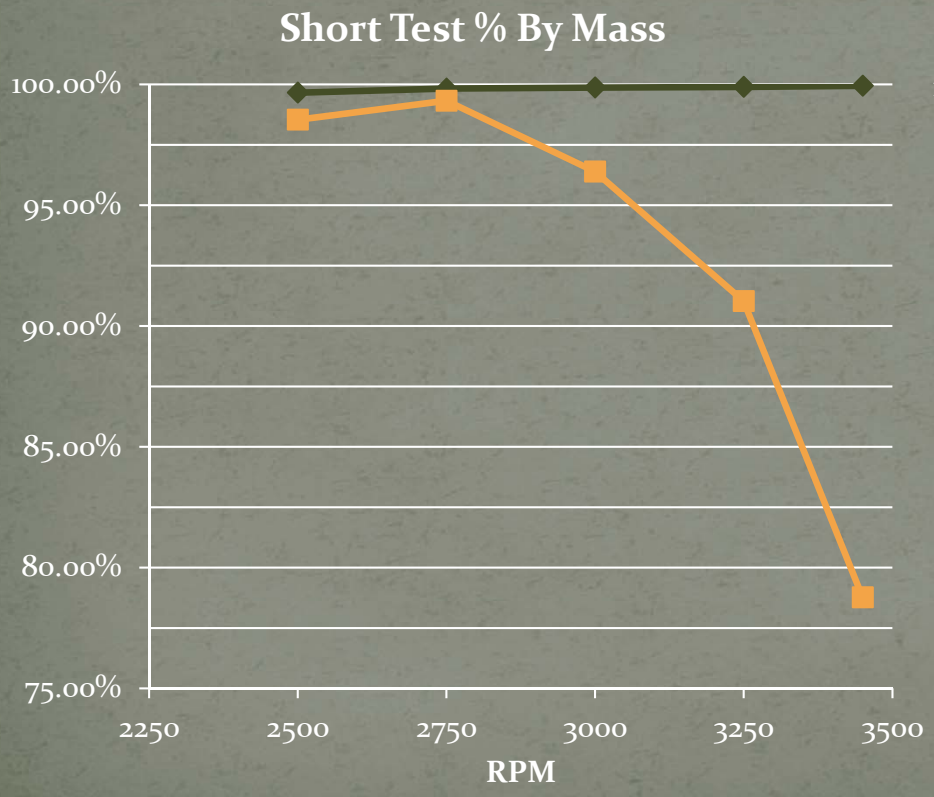


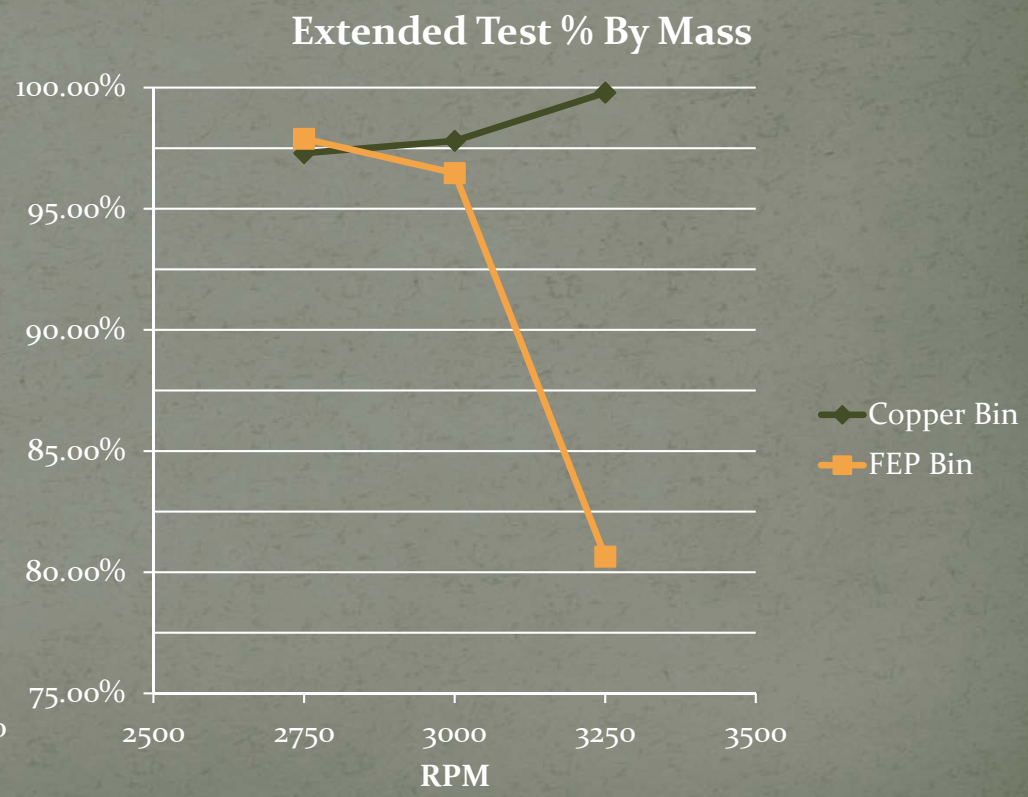


Prototype Setup

Prototype Video

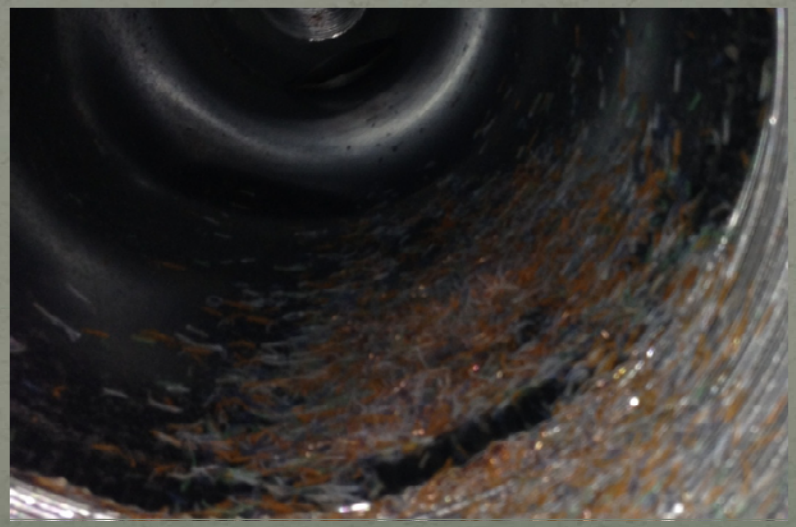
Data


Short Test % By Mass
100.00%
95.00%
90.00%
85.00%
80.00%
75.00%
2250
2500
2750
3000
3250
3500
RPM


Extended Test % By Mass
100.00%
95.00%
90.00%
85.00%
80.00%
75.00%
2500
2750
3000
3250
3500
RPM
Copper Bin
FEP Bin

Problems Encountered

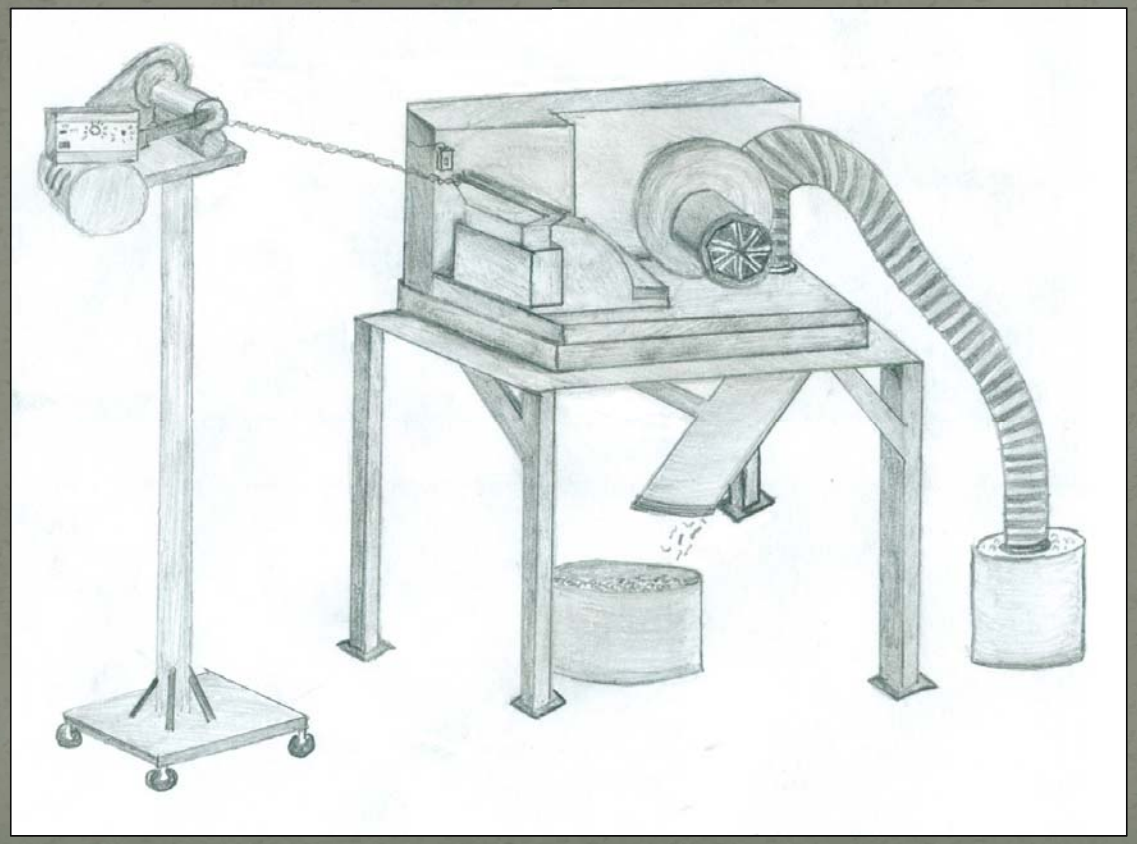
- Static electricity
  - Causes FEP insulation to collect on walls of classifier
  - Pronounced on extended tests



Problems Encountered

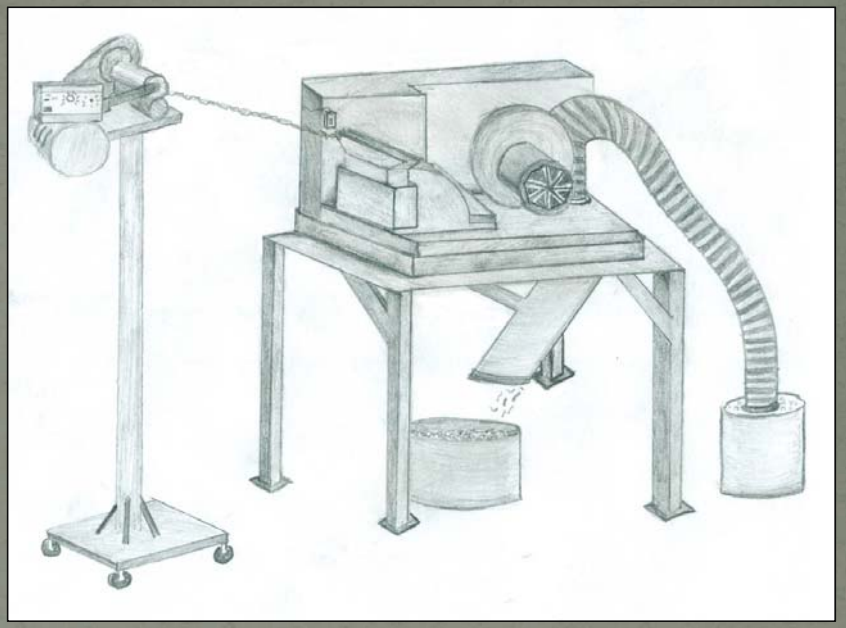
- Material failure
  - Caused by copper bits moving at a high velocity through machinery and ductwork

Recommended Layout



Recommended Layout

- Pros:
  - More like our original model
    - Bits take separate paths
  - Potential static solution
  - Minimal material wear
  - More uniform velocity profile
  - No additional power requirements
  - No material stuck in grinder
- Cons:
  - Grinder and splitter must be above ground level
  - Requires permanent modification to the grinder



Economic Benefit

- Average twinned FEP scrap: 3692 lb/month
- Savings per month:
  - Insulated Scrap: $8,284
  - Clean Scrap: $10,221
  - Energy costs: $61.56
  - Net Savings: $1,875/month
- Payback Period: Less than 1 year.

Conclusions

- Concept has been verified large-scale
  - Implementation not perfect
- Recommended Layout
- 1st – Generation Design
  - Juniors?

Acknowledgements

- Faculty Advisors
  - Dr. Van
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- Other Contributors
  - Dr. Pingen
  - Dr. Bernheisel

Questions?