Machine Chip Disposal System

Background
- Accu-Precision: aerospace and industrial manufacturer in Littleton, CO
- Daily machining operations yield hundreds of pounds of metal chips to be recycled
- Recycling process requires machinists to lift and tip bins into large dumpsters by hand
- Dangerous and takes away from machining time

Current Disposal
- Average one chip disposal per machine everyday
  ~30 disposals/day
- Disposal process takes two machinists ~15 minutes/disposal
- Human hours: 15 hours/day or ~450 hours/month

Project Requirements
- Operable by a single machinist
- Capable of lifting and disposing up to 600 lbs. of total weight (machine chips and bin)
- No actuation if swing arm not completely closed
- No movement of the device when power lost
- Entire disposal process takes < 10 minutes
- Compatible with both the large and small bin
- Safety Factor ~ 5

Machine Design
- Clamps
  - Attaches to dumpsters
  - Restricts movement during operation
- Forks
  - Compatible with both bin sizes
- Swivel Caster Wheels
  - 800 lbs. each
- Swivel Arm
  - Physical barrier between machine and operator
  - Allows side access for bin loading
- Safety Button
  - Activated when swing arm is closed
  - Cuts off current to all actuators
- Rotational Actuators
  - 3000 lbs. each
- Vertical Actuator
  - 2000 lbs.
- Pillow Block Bearings
  - 6600 lbs. each

Dumpster Layout
- Dumpster-to-wall constraint
- Dumpster-to-post constraint
- Two dumpster sizes

Machine Motion Process
- Clamp machine and open swing arm
- Load bin and close swing arm
- Vertically actuate to height of dumpster
- Rotationally actuate until bin empties

Simulation Analysis

Electronics
- Device weighs over 1000 lbs.
- Lifts 500 lbs. of chips over 8 ft in the air
- Device has built-in safety redundancies
- Tests basic features and then progresses to full scale
- Pass/Fail testing program logs successes and failures

Safety and Testing
- Saves Accu-Precision ~300 hours/month of time
- Reduces handling time and physical strain
- Increases safety and efficiency in machine shop
- Improves Accu-Precision’s company economics

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