Rexnord Automatic Deburring Machine

Final Design

Corp 9 Project Group

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Dr. Beale – Comprehensive Design One – MECH 4240 – Spring 2010

MISSION OBJECTIVE

Our mission is to:

- Create an automated deburring and transport system while:
  - Reducing production time
  - Improving overall quality of the finished product
  - Improving the efficiency of the waste removal process

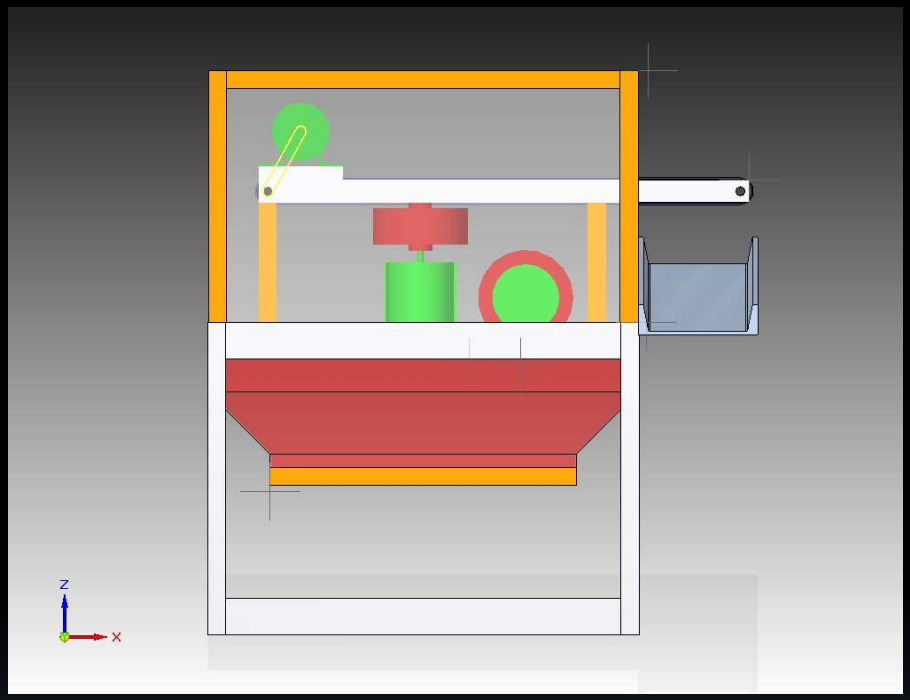
System Requirements

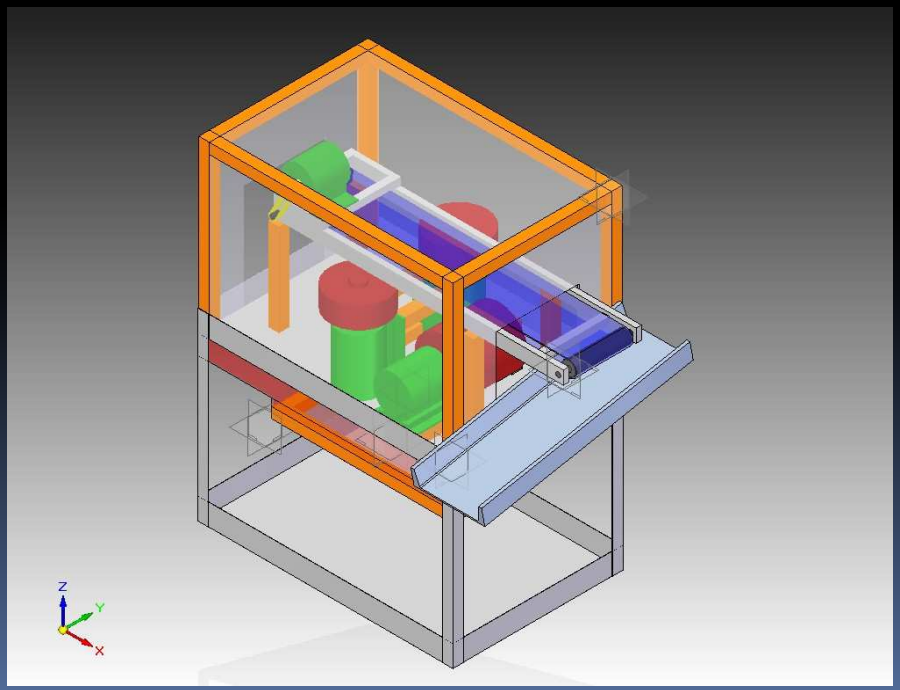
- Deburr all sizes and shapes of the specified parts.
- Leave the necessary finish on the part surface.
- Fully automated from beginning requiring no aid from an operator.
- Automatic collection and removal of dust.
- No sparks must be generated during deburring process.
- Must deburr the bottom and sides of each part.
- Must be free to quickly move to other cells.
- Deburring system must meet all OSHA safety and environmental standards for operations.

Subsystem Level Requirements

- Entrance conveyor must be adjustable
- Magnetic conveyor must be stable.
- Magnetic conveyor must release part onto exit ramp
- Exit ramp must be able to support two parts of any size
- Radial deburring brushes must remove burs without damaging part
- No sparks
- Active dust collection system to remove all dust and store in a hopper for later removal.

Machine Architecture



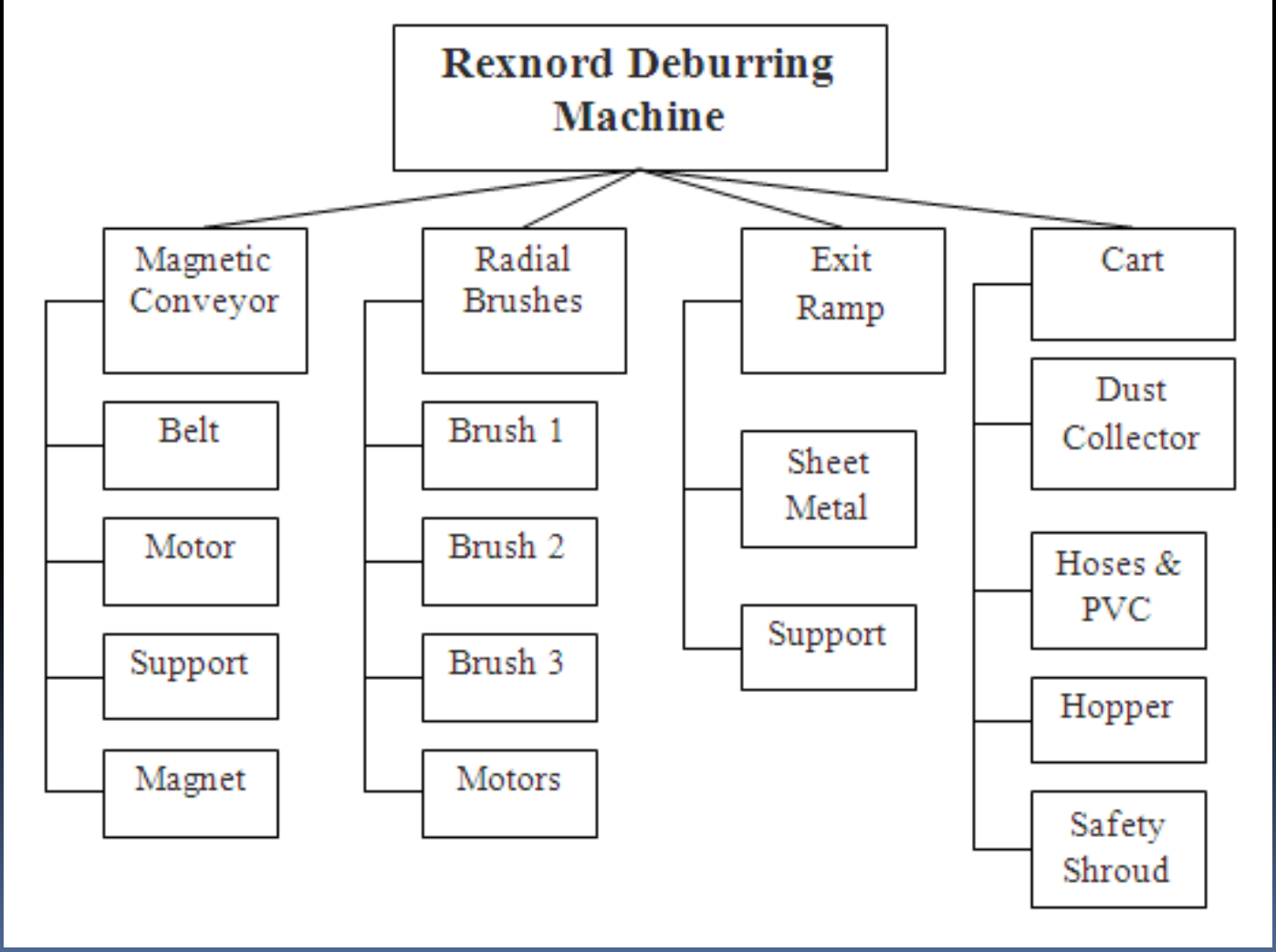


Technical Resource Budget Tracking

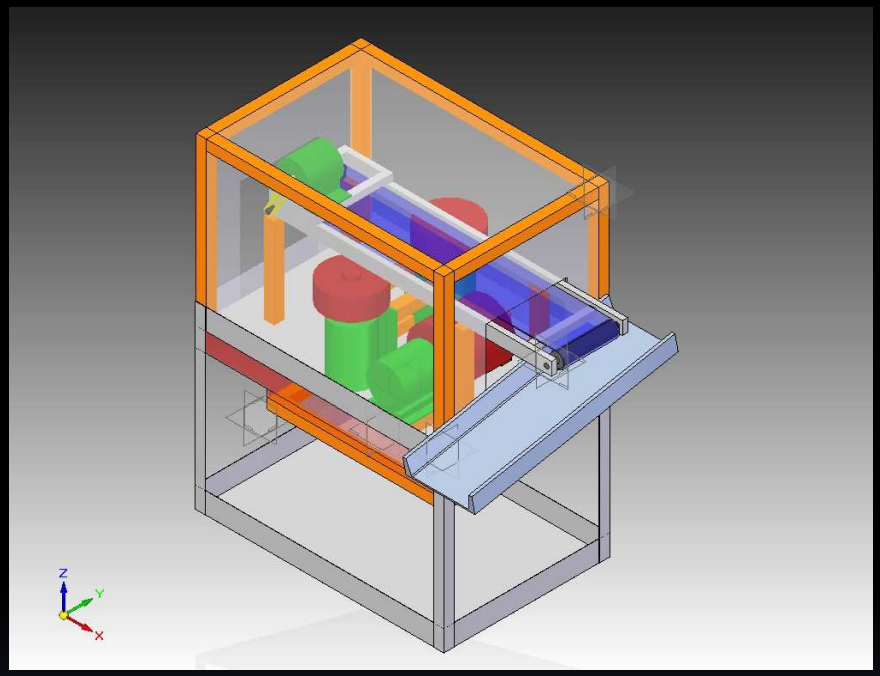
- Volume –
  - 2 feet wide, 4 feet long, 5 feet tall
  - 40 cubic feet
- Weight –
  - The cart being used to hold the entire system has a capacity of 500 lbs.
- Power –
  - 120VAC 60 Hz source will power all motors, conveyors, sensors, and the relay.
  - The brush motors are ¼ horsepower and operate at 1725 rpm.

Item	Weight (lbs)
Cart	40
Motor	52
Hopper	10
Brushes	9
Exit Ramp	20
T-tubing	146
Total	**277**

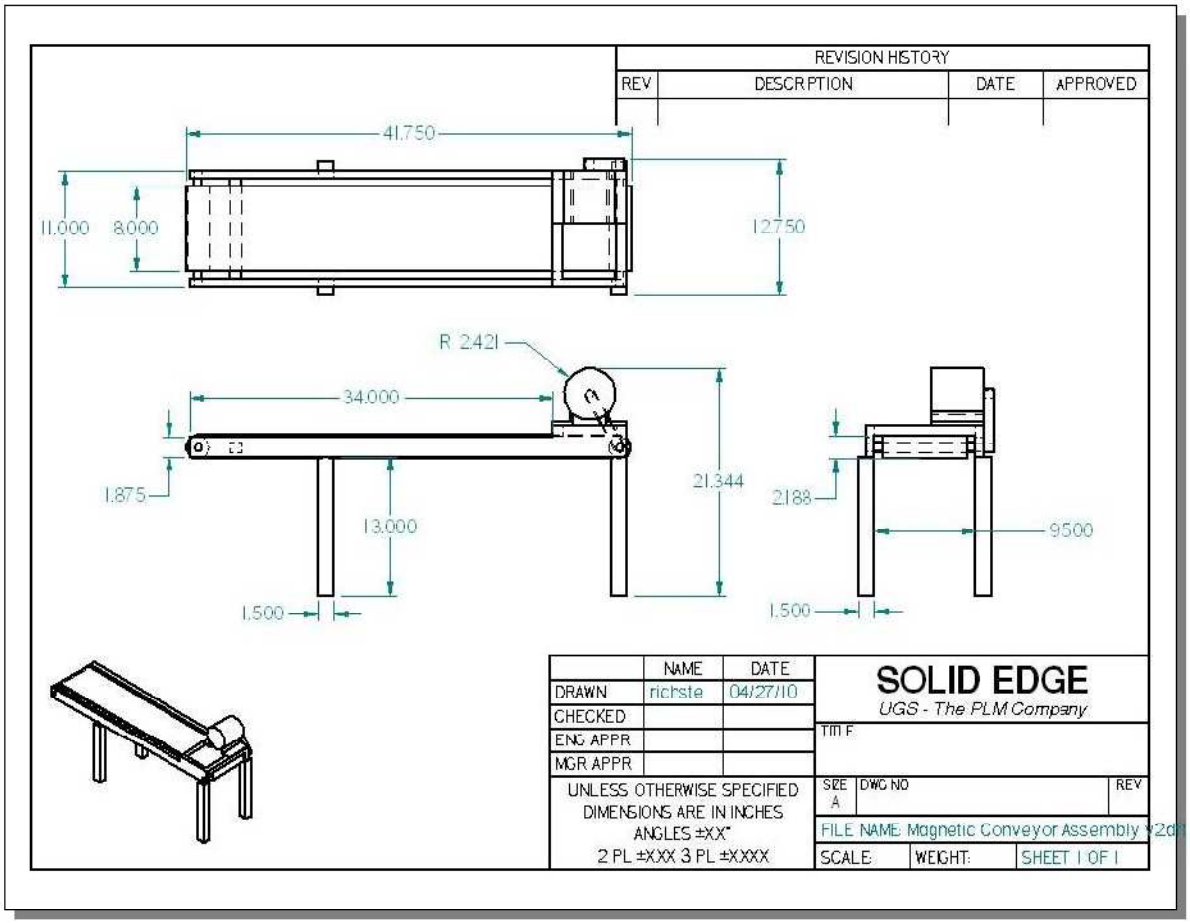
Product Hierarchy

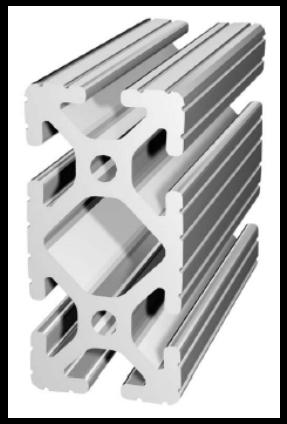


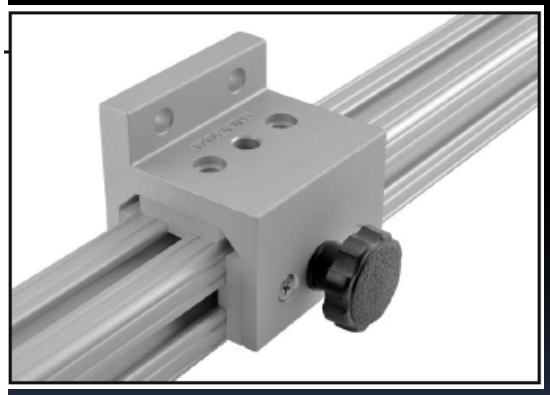
Structure and Safety Shield



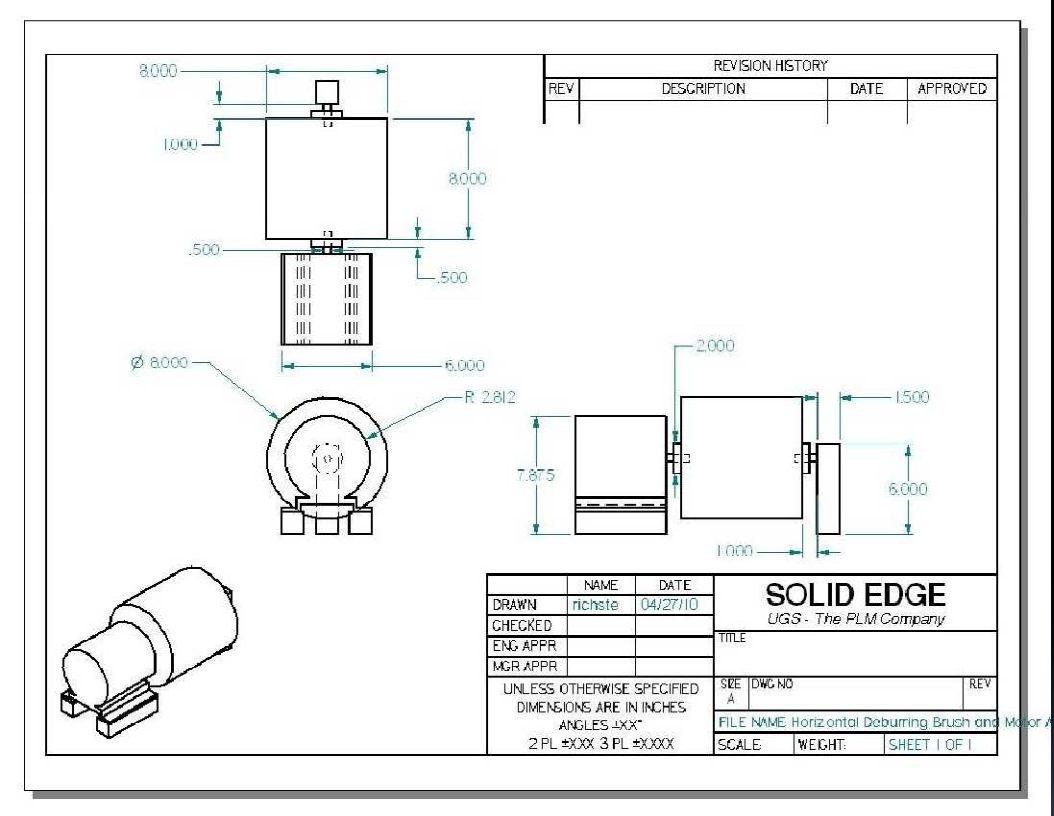
Magnetic Conveyor

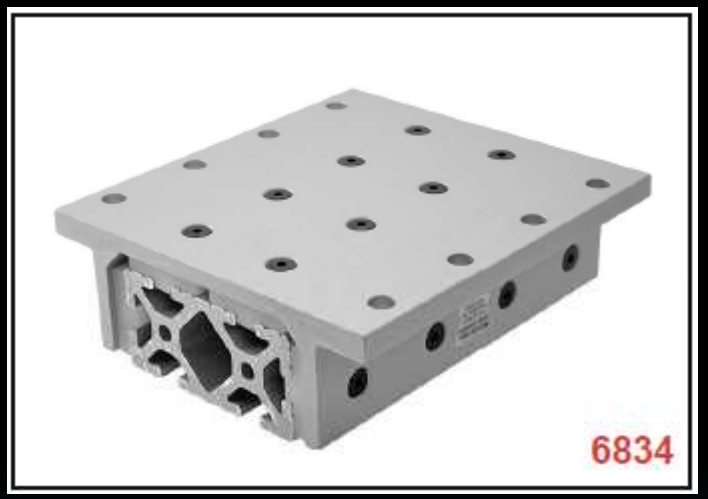




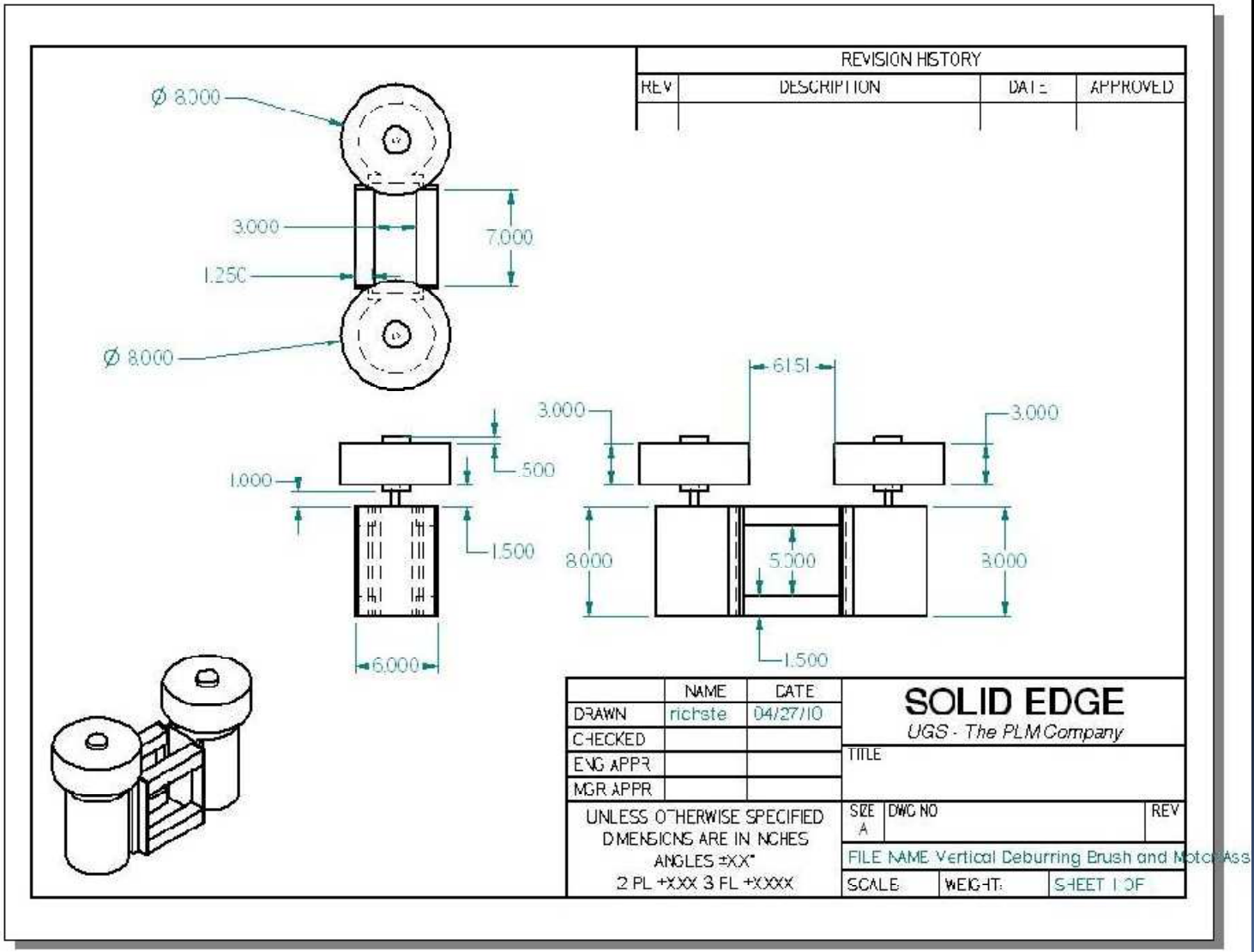


Deburring Brush

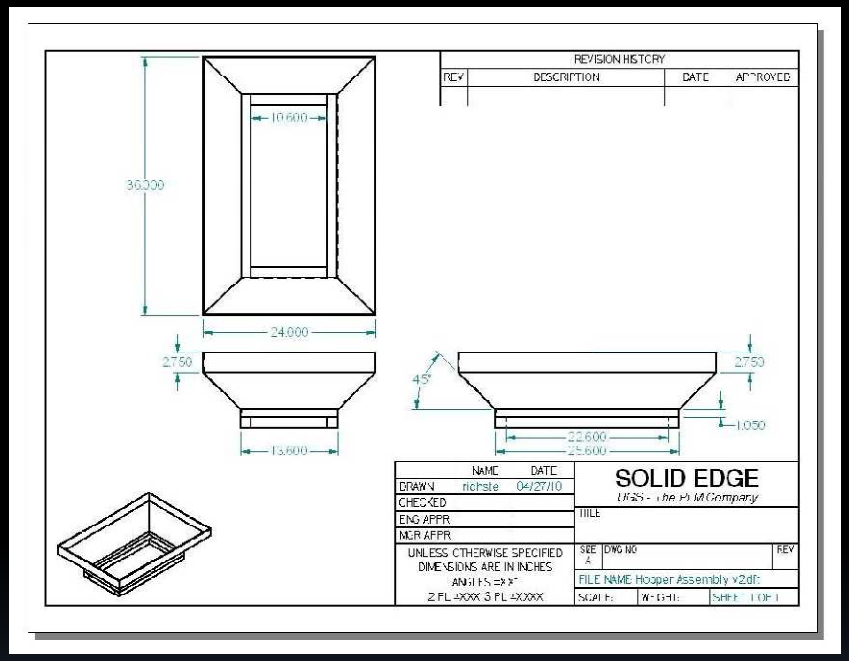


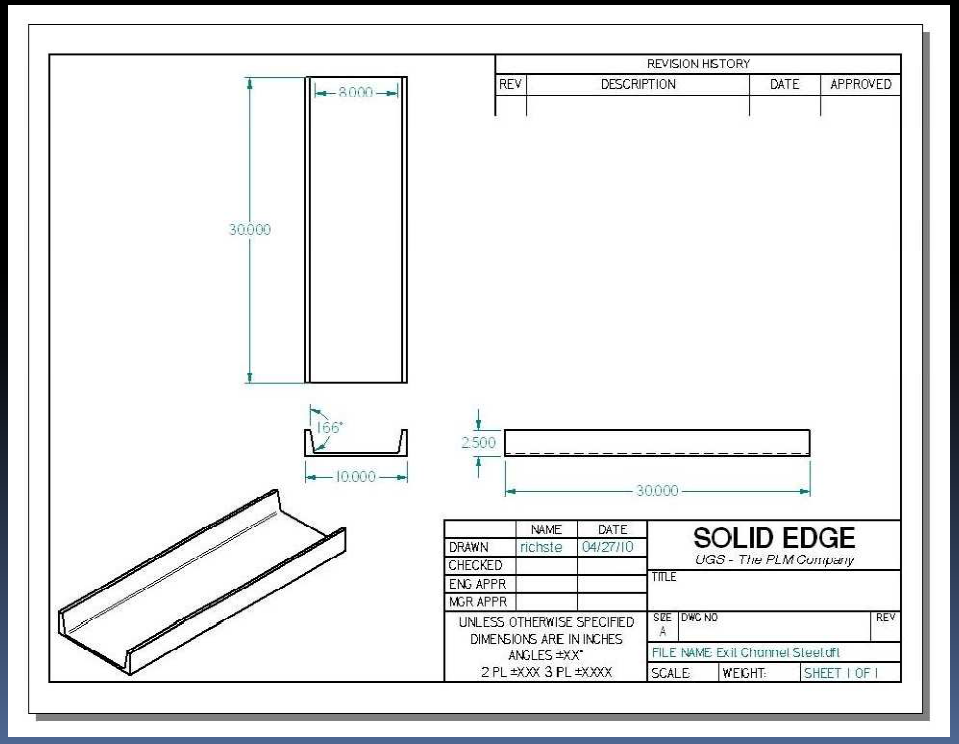


Deburring Brushes (sides)

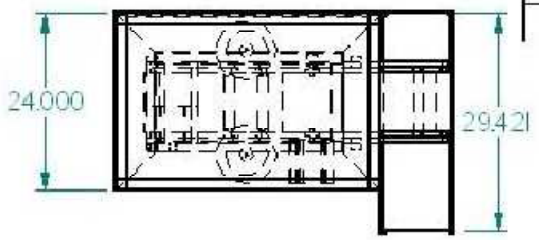


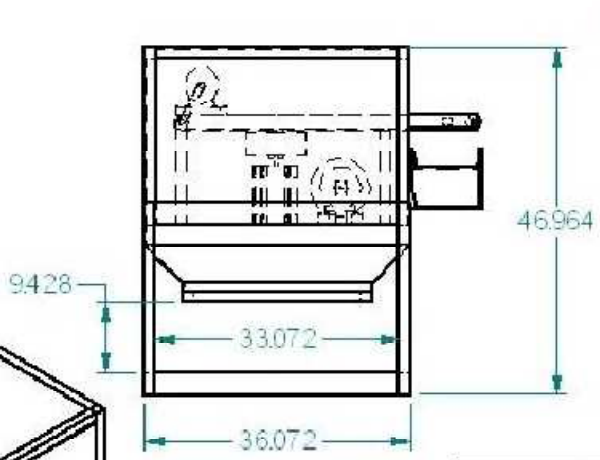
Dust Collector and Exit Ramp

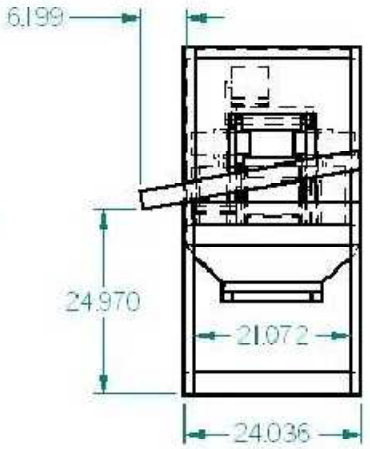


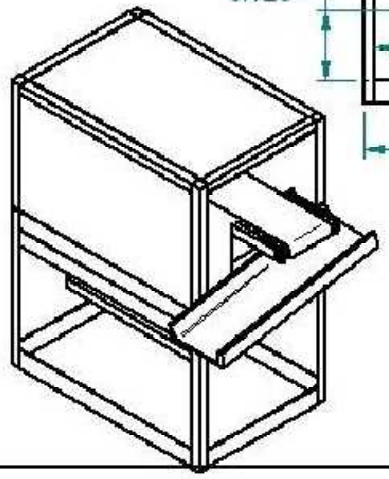


REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED









	NAME	DATE
DRAWN	richste	04/27/10
CHECKED		
ENG APPR		
MGR APPR		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
ANGLES ±XX°
2 PL ±XXX 3 PL ±XXXX

SOLID EDGE
UGS - The PLM Company

TITLE

SIZE	DWG NO	REV
A		

FILE NAME: Final Assembly v2.dft

SCALE	WEIGHT:	SHEET 1 OF 1

Wiring Diagram and Controller

- Insert locgic controller
- Wiring diagram

Bill of Materials

Quantity	Part	Part #/Company	Price ($)
2	Light Sensor	65845K56 / McMaster 65845K57 / McMaster	284.22
1	Timed Relay	2809T41/ McMaster	60.83
1	E-Stop	Idec HW1X / Wolf Automation	32.50
1	Bearing and Mount	6244K56 / McMaster	38.65
1 or 3	Brush Motor	3K771 / Grainger	74.00 ea
1	Motor Control	FA206 / Keenzo	28.97
1	Door Switch	65665K13 / McMaster	80.03
1	Magnetic Conveyor	Custom / Bunting Magnetics	4,011.00
1	Duct System	Custom / American HVAC Parts	50.00
1	Exit Ramp	Custom / Metals Depot	38.24
1	Cart	WES101 / Hand Trucks	103.98
1 or 3	Deburring Brush	Custom / Industrial Brush	362.25 ea
	Structural Parts	80/20 Parts	1873.74
		Total Cost	**6,487.09**

Burden Rate

- burden rate =$35 /hr ($0.58/min)
- 33.3 min x $0.58/min =$19.425 /day.
- $389 dollars will be saved per month.
- Cost $6514.97 / $389
  =16.77 months machine payback.

Medical Implications

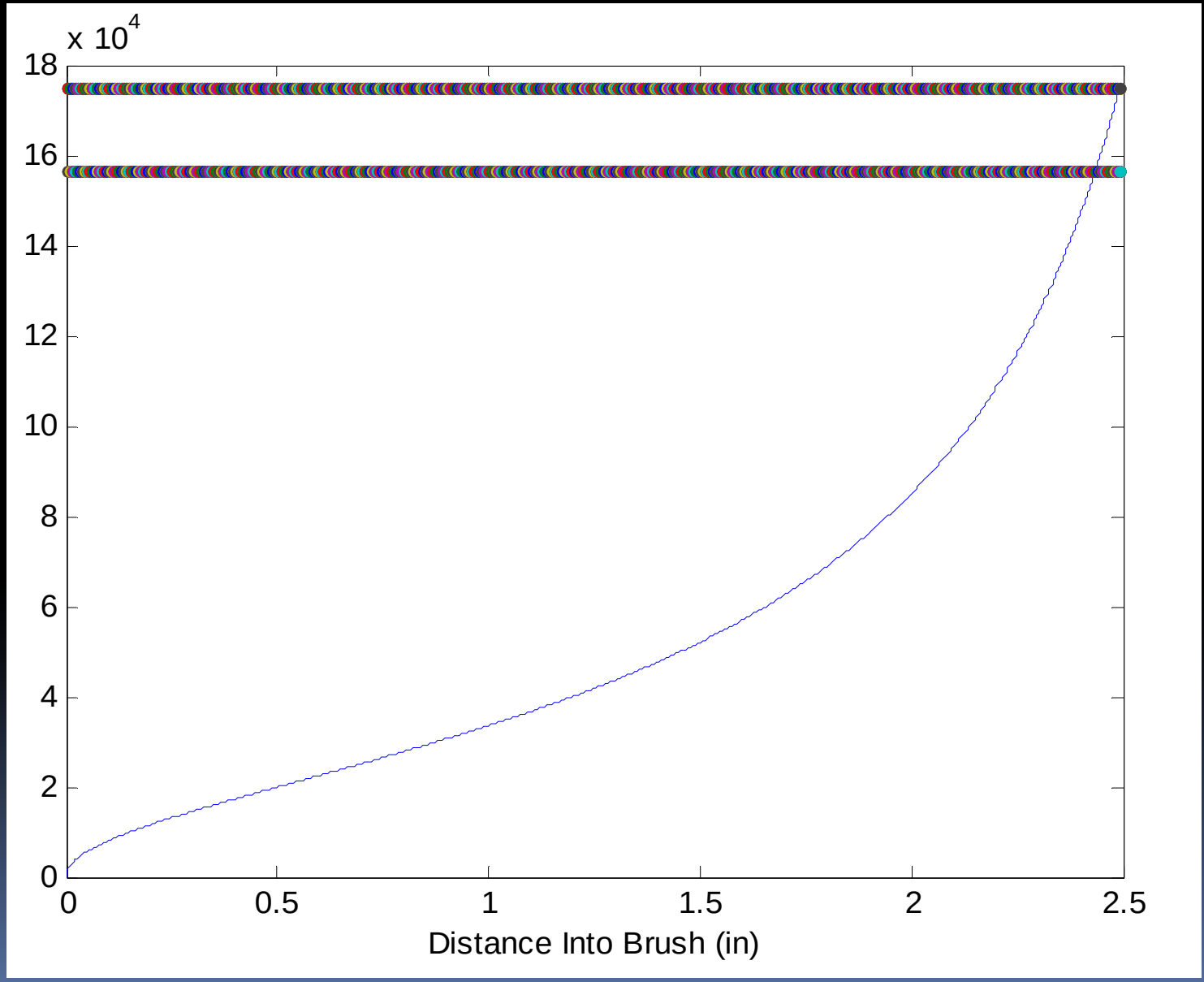
- More Ergonomic
- Less work for operator
- No sparks, or handling part at all
- Less steps traveled by operator
- Less Stress for operator=more productive

Increase in Productivity

- 2500 parts per month (125 parts per day)
- deburr one part is 16 seconds (33.3 min/day)
- 33.3 min/ 4 min cycle time= 8.3 parts
- 47 dollars per part x 8.3= $376 dollars per day
- 20 work days/month = $7520 revenue/month
- 20-30% profit margin=

  $1504 to $2256 /month profit
- The Deburrer pays for itself in 2-4 Months!!

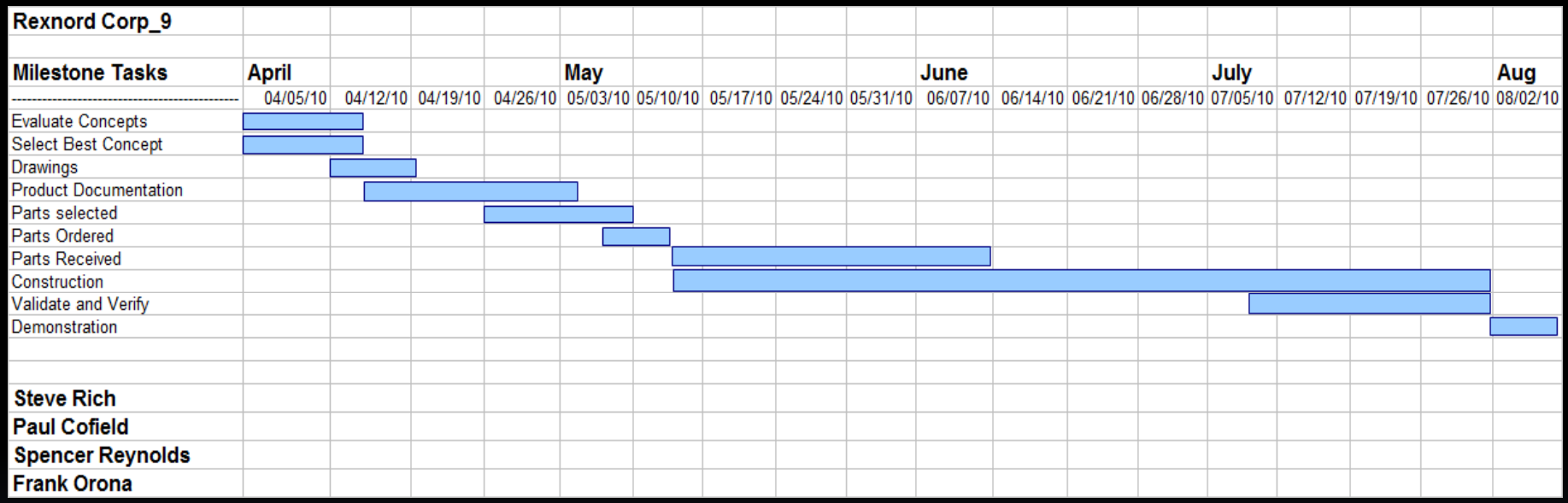
Brush Analysis



Risk Assessment

Rank	Risk Title	Risk Exp	Action	Risk Type	Status
1	Part not deburred sufficiently	Likelihood: Low Consequence: Hi	Research/Watch	Technical/ Program	Speed adjustment on conveyor and brush motors
2	Cost Effectiveness	Likelihood: Low Consequence: Mod	Research	Organization	The machine has been analyzed and determined to have a satisfactory pay-back period
3	Brush wear	Likelihood: Low Consequence: Low	Watch	Organization	Brushes will need checking and replacement on scheduled intervals
4	Dust collector blocked	Likelihood: Mod Consequence: Low	Watch	Organization	Hopper will need to be emptied on a timely basis for proper maintenance
5	Timing Issue	Likelihood: Low Consequence: Low	Research/Watch	Technical/ Program	The machine has been timed effectively to maintain pace with the operator and supporting machines.

Estimated Timeline



CONCLUSION

- "Keep It Simple"
- The refined system meets all standards and requirements:
  - Lighter
  - Cheaper
  - Smaller
  - Continuously running
  - Simple maintenance
  - No sparks
  - Minimize dust

Questions?