IPRO 497-347

Tool Management System & Feed Mechanism Design

(Smith & Richardson)

Introduction□

Problems

- Design a feeding system for a welding machine to make it autonomous.
- Develop an electronic tool management system for Smith & Richardson's tool crib.

Objectives

- Identify methods, materials, and systems that can be used to automate a semi-automatic sorting and placement operation for casting chaplets.
- Build a deliverable prototype.
- Develop a comprehensive electronic tool management system that will keep track of the location of Smith & Richardson's tools.
- Create a program that will help predict tool-wear life for the purpose of preventative maintenance.

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Organization

- Two separate problems = two separate teams.
- Mechanical and Database teams
  - 5 members each.

Work Breakdown Table

Tasks	Start Date	Duration (Days)	End Date
ProjectPlan	09/03/2009	8	09/11/2009
Planning Phase Tools	09/11/2009	24	10/05/2009
Planning Phase Machine	09/11/2009	24	10/05/2009
Midterm Reviews	09/21/2009	14	10/05/2009
Construction Phase Machine	10/05/2009	29	11/03/2009
DevelopmentPhase Tools	10/05/2009	29	11/03/2009
Ethics Reflective Report	11/04/2009	7	11/11/2009
FinalProjectReport	11/06/2009	14	11/20/2009
Testing/Implementation Both	11/03/2009	20	11/23/2009
Abstract/Brochure	11/16/2009	14	11/30/2009
HalfWayCustomerPresentation	11/18/2009	12	11/30/2009
Poster	11/23/2009	7	11/30/2009
FinalPresentation	11/11/2009	21	12/02/2009
FinalProjectReport	11/13/2009	21	12/04/2009

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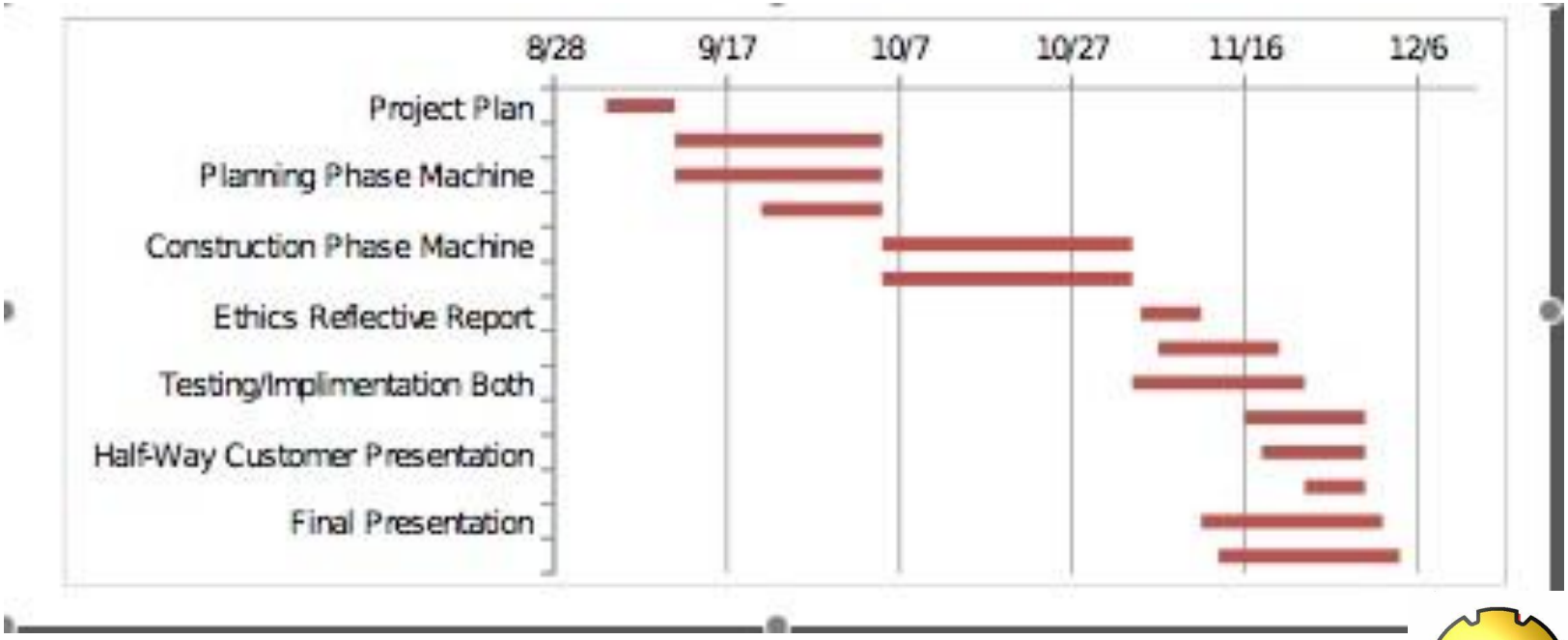
GANTT Chart



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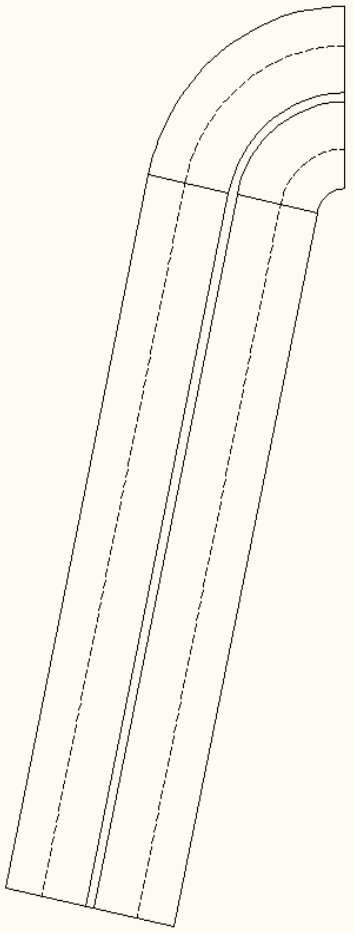
Mechanical

Approach

- Tried to figure out how to get the disks oriented correctly - vibratory bowl.
  - A vibratory bowl is a piece of industrial equipment that is designed to sort and orient small parts.
  - It sorts by vibrating rapidly and moving pieces up a ramp to a point where only correctly oriented disks can pass.
  - (see next slide)

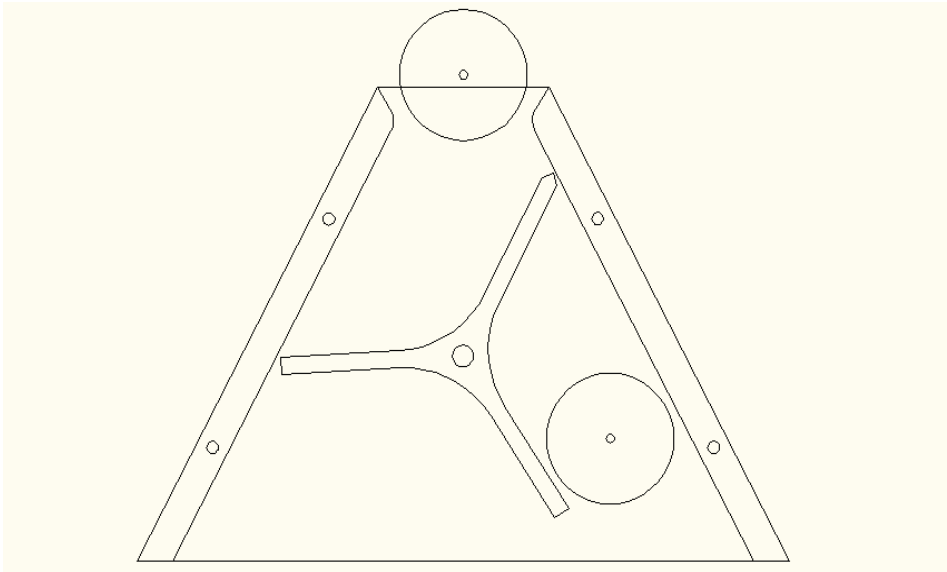
Approach (cont)

- We then focused on designing the track that would take the oriented disks to the welding plates.
  - We came up with a three piece design that effectively transports the disks.



Approach (cont)

- We then had to find a way to evenly divide the single stream of disks into two even streams (even to avoid system backups).
  - We developed a flipper mechanism that we successfully prototyped.



Prototype

Approach (cont)

- Designed a way to turn the disks so that the two streams would end up pointing in the right direction.
  - The most promising was a twisting ramp design.
- Looked at the track that would connect the twisting track to the welding plates.
  - We designed track that acted like a funnel.
  - Sends the disks right into the welding plates

Results

- We have a functioning track, flipper, and funnel prototypes.
- Due to time restraints, we were not able to fully prototype the twisting track.

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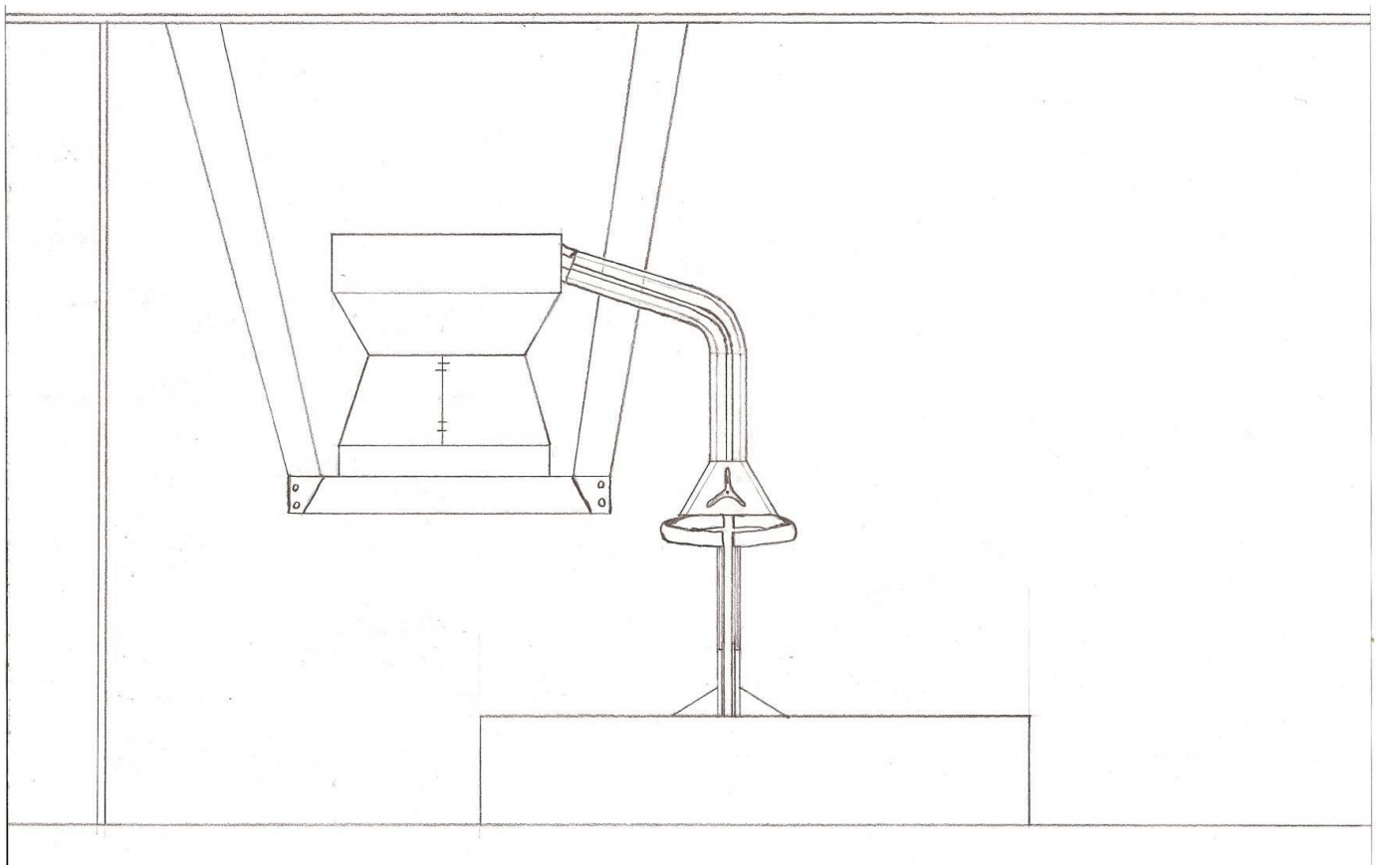
Conclusion

- We have developed a plan for how our system would go together if fully implemented.
- Our client can then take this and bring it to completion or use it as a starting point for a system of their own

  design.
  - See next slide.



Database

Approach

- Research tool management systems and methods of Optical Character Recognition (OCR)
- Investigate cooperation with software company to make modifications
- Design a supplement for tool-wear prediction

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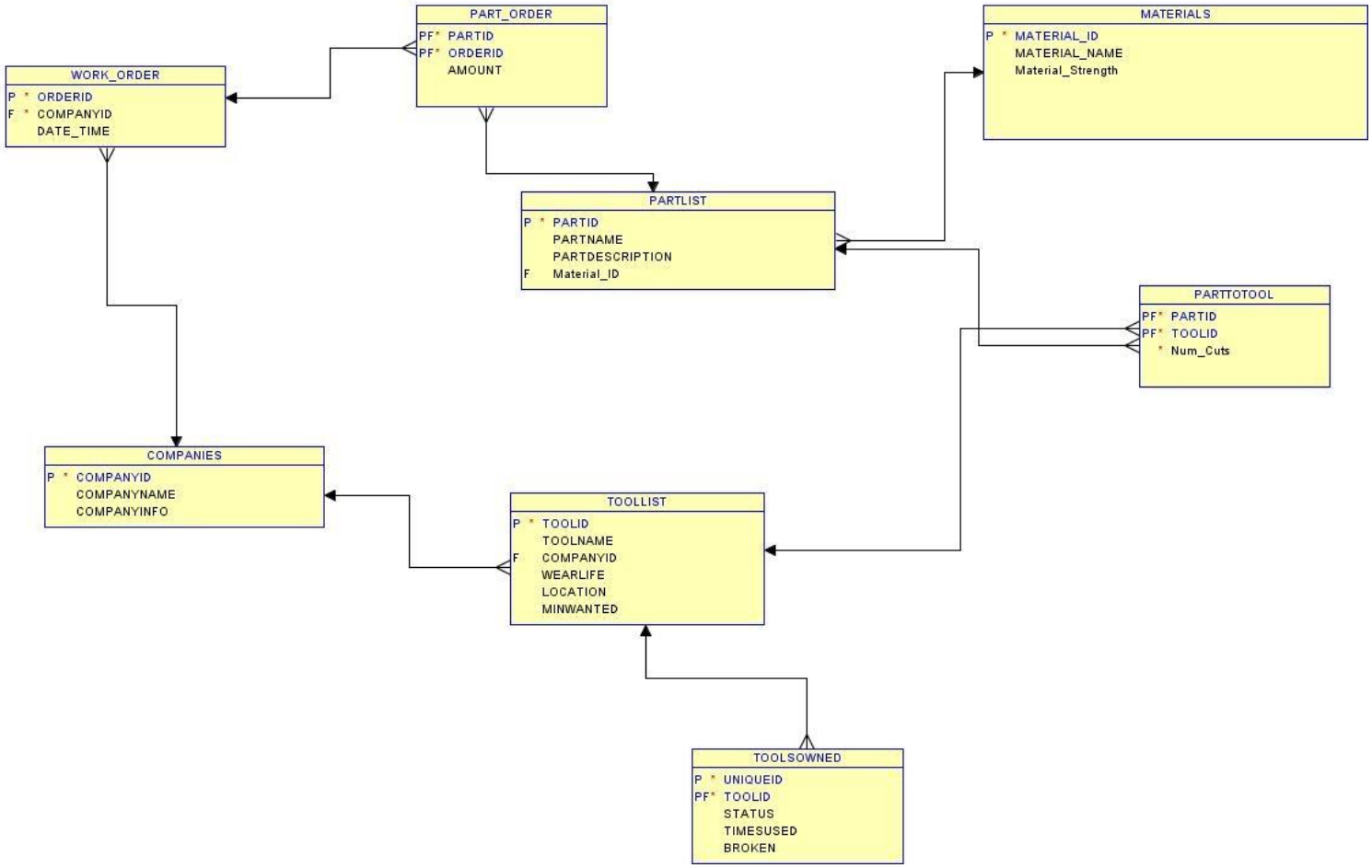
Results

- Company's program already has the requested tool-tracking functionality
- OCR is sufficient to input old data
- Supplement works as expected
  - quantity * material coefficient * number of cuts = approximate tool usage

Programming Flowchart



Conclusion

- Company can predict tool wear.
- Current program will be used to manage the tool crib.
- OCR is efficient and will be used for entering data from paper documents.

Acknowledgements

- Smith and Richardson - IPRO Sponsor
- Phillip Lewis - Faculty Advisor

Needs/Questions/Requests?