

Reading Guide #5: Implementation II

MECH 223 Reading Guide

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1 Reading Assignment #5

1.1 Overview

We are now presenting material related to refining your designs. The primary topics are:

- Failure modes and effects analysis (O)
- Estimating cost (O)
- Mechanisms (H)

1.2 Reading Sections

Failure Modes (Ostafichuk):

Required: “Eggert – Failure Mode Effect Analysis.pdf” posted on WebCT. This gives a brief introduction to how you can assess risk in parts, devices, and processes using the failure mode effect analysis (FMEA) procedure. This is a common tool used in industry. After completing this reading you should know what a failure mode is, the parameters that effect risk, and how we quantify risk. You do not need to memorize the steps in FMEA but you should be familiar with them.

Estimating Cost (Ostafichuk):

Required: Ulrich & Eppinger, Chapter 15, Appendix A (pp. 325-8). This gives you a quick overview of how an amount of money at one time has a different value at another time due to interest. After completing these readings, you should be familiar with how to calculate net present value (NPV) and the concept of *sunk costs*. It is recommended that you read this Appendix before moving on to the next reading.

Required: Ulrich & Eppinger, Chapter 15, pp. 308-13. Focus on understanding what Exhibit 15-2 is describing and how NPV is used to evaluate all cash flows present and future.

Mechanisms (Hodgson):

In future years, you will take courses that will go into great detail on the sizing of various important mechanical components such as bearings and gears. The purpose of these readings is to acquaint you with some of the important elements that are practically required to make functional machines.

Required: Mott (PDF) – shaft attachment, couplings and seals: pp 508-526. Concentrate mainly on the pictures. The point is to acquaint you with the different types of devices that are available, rather than the technical details. You should understand the purpose and main advantages and disadvantages of each type of pin or shaft connector or retaining ring or coupling. Also pay attention to the various sealing diagrams so that you understand the advantages and disadvantages of the different methods.

Required: Erdman (PDF) – linkages: pp 2-9. As Paul Conder mentioned in his talk, linkages are extremely useful for providing complex mechanical movements and four-bar linkages are the simplest examples of these devices (the chair he described was based on a 4-bar linkage design). This set of readings will acquaint you with the basic terminology related to linkages (note that the input link is also often referred to as the crank and the follower as the rocker) and show you some practical examples of how they're used.

Highly Recommended: Review material on flexures from minCD readings last block. We did not have time to discuss flexures in detail during the minCD session last block, so we'll revisit them this time.