REMEMBER, QUALITY IS OUR TOP PRIORITY.

QUESTION: IS IT MORE IMPORTANT THAN SAFETY?

OHH... I FORGOT ABOUT THAT ONE.

QUESTION: IS QUALITY MORE IMPORTANT THAN OBEYING THE LAW?

WELL, PROBABLY NOT.

IF WE COULD MAXIMIZE SHAREHOLDER VALUE BY SELLING LOWER QUALITY ITEMS...

...WOULDN'T WE HAVE A FIDUCIARY RESPONSIBILITY TO DO IT?

I'M SURE IT'S IN THE TOP FOUR.

WHAT IF WE HAD TO LIE TO ACHIEVE QUALITY?
Phases of Design

1) Customer Requirements
2) Specification Development
3) Conceptual Design
4) Detail Design
5) Specification of Production  
6) Manufacture

Quality Assurance
Quality

Defined by
• Consumers
• Producers

Values Set by
• Standards
  Government
  Industry
  Company
• Liability
• Economics
Quality-Problems

Defined by
• Consumers
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Values Set by
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  Economics
Quality-Problems

Defined by
- Consumers
- Producers

Values Set by
- Standards
  - Government
  - Industry
  - Company
- Liability
- Economics

14-6 175 Pacer Carbon
Single point break
Quality-Problems

Defined by
• Consumers
• Producers

Values Set by
• Standards
  Government
  Industry
  Company
• Liability
  Economics
Quality-Problems

- Liability Economics
Faulty Mechanical Switches
Non-Contact Switches
(No moving parts)
Quality-Problems

- Liability
  Economics
Quality Issues of Two-Wheeled Inverted Pendulum Transporters?

phillips.blogs.com

www.tripadvisor.com
Three Quality Categories

1) Quality of design
   Easy to produce and assemble
   Easy verification and testing
   Good serviceability

Improvement comes from:
   • Detail Design
   • Manufacturing
Three Quality Categories (cont.)

2) Quality of conformance

   Size
   Internal performance specifications
   Assembly tolerance

   Improvement comes from:
   
   • Q/A department
   • quality circles
   • manufacturing systems
Three Quality Categories (cont.)

3) Quality of performance
   Length of useful life
   Functionality
   Customer satisfaction
   Improvement comes from:
     • life testing
     • documentation
     • marketing feedback

The 3 categories are intrinsically linked
   quality of design
   quality of conformance
   quality of performance
History of Quality in Engineering

• Pre-Industrial age
  • individual craftsmen
  • apprentices
  • regulated by self-control: sales, death of customers, witch hunts

• Mass production
  • Interchangeable parts (tolerances)
The Early Days

Frederick Taylor (Taylorism)

- QC is in the hands of the managers
- Workers simply follow orders
  - adversarial relationship with management
  - does not make use of worker knowledge
  - gives managers control over a process they may not understand well

Inspection Departments (1930’s)

- Looking for defective parts
  - it is too late when you find a bad part
  - looking for a bad part promotes a negative attitude
  - cannot inspect quality into a product or process
Statistical Analysis (Shewhart)

- Too many parts to inspect 100%

- Analyze process
  - averages (trends)
  - standard deviation

- Change process & monitor effects
Modern Management for Quality Assurance

• Involvement of employees
  – uses expertise
  – avoids antagonistic relationships

• Management & employees work together

• Understand needs
  – employees
  – consumers
Informal Quality Organizations: Quality Circles (Background)

- Small voluntary groups to upgrade quality
- Group selects a theme to be addressed
- Technical specialists support the group
Quality Circles (Information)

• Complement management
• Lead to worker commitment
• Often utilize human resources better
• Strengthen existing programs
• Provide an excellent method of training
Quality Circles (Implementation)

- Quality circles must be taken seriously by management and by workers
- Quality circles & management should have common goals
- Quality circles need guidance from management
- Quality Control (QC) methods must be explained to circle members
- Quality circles must expand to meet their goals
  - Management
  - Suppliers
  - Consumers
Example Quality of Design: TV Transformer

- Goal: Produce 18 V DC.
- Output of transformer adjusted by varying a potentiometer.
- Potentiometer sensitive to temperature, vibration, etc.
- The relationship between the potentiometer setting and the transformer voltage is:
Example: TV Transformer (cont.)

- **Recommendation**
  - Achieve target value at the peak of the curve. Use a voltage divider to get 18 V.

- **Reason**
  - Sensitivity is reduced for the small cost of a few resistors.

- **Result**
  - Increased product life.
  - Improved picture.
Demming’s 14 Quality Points

1) Create constant desire to improve product or service.
2) Adopt new philosophies/methods. (Where applicable)
3) Avoid mass inspection for quality control. (Improve design & process)
4) Improve quality of incoming materials (supplies).
5) Improve constantly and forever the system of production and service. (Demming Cycle)
   – Recognize the opportunity.
   – Test the theory to achieve the opportunity.
   – Observe the test results.
   – Act on the opportunity.
Demming’s 14 Points (cont.)

6) Institute good job training.
7) Institute good leadership & supervision.
8) Drive out fear, so that everyone may work effectively.
9) Break down barriers between departments.
10) Eliminate slogans, exhortations, and targets that ask for zero defects and higher levels of productivity.
Demming’s 14 Points (cont.)

11) Eliminate work standards that prescribe numerical quotas.

12) Remove barriers that rob employees of pride of their workmanship.

13) Institute a vigorous program of education and self-improvement.

14) Put everybody in the organization to work to accomplish quality improvement.
Quality in Your ME2110 Project:

1) Get every team member to buy in and contribute

2) Every member should be able to build/repair device

3) Test, Test, Test (record and analyze data)
Questions?