University of Minnesota
• **Steam Distribution** – 11 miles of piping
  - **Minneapolis Campus**
    - 200 psig saturated steam
    - Gravity Cond Return, 95% return
    - 773,000 lb/hr capacity
    - 95% piping in tunnels
  - **St. Paul Campus**
    - 150 psig saturated steam
    - Gravity Cond Return, 95% return
    - 500,000 lb/hr capacity
    - 90% piping in tunnels

• **Steam Utilities Operations/Maintenance**
  - 1 Principal Engineer/Supervisor
  - 18 Pipefitters
  - 3 Insulators
  - 4 Laborers
  - Supported by 2 Plumbers from Water-Sewer Utility
What do we all have in Common?

We all need to make the most effective and efficient use of our limited resources – people, materials, money.

We all have some metrics that are used to make the best use of our resources and we all have a need to make better use of our resources.
• **Topics Covered**
  - Steam Reliability Metrics
  - Steam Operation Activities
  - Equip. Organization and Tools
  - Initiatives to Improve Steam
  - UM Enterprise Asset Management

**Input from the Group for Each Topic After Presentation**

**Overall Presentation Approach**
Steam Utilities Reliability Metrics

- Utility Incidents
  - # / Month

- Estimated Meter Readings
  - # Estimated / Month

- Preventative Maintenance (PM) Yield (Ratio)
  - # Corrective Maintenance WO hrs / Total # PM Hrs

- PMs Completed On-Time (%)
  - # PMs not Completed / Total # PMs Due

Reliability Metrics

UM Energy Management Reliability Metrics
• **Steam Operational Activities (PM)**
  - **Monthly Tunnel and Steam Vault Inspections:**
    - Walkdown of all tunnels/vaults
    - Condition of Steam Traps, Pipe Supports, Structures, etc.
  - **Annual Tunnel/Vault Housekeeping:**
    - Washdown tunnel components
    - Inspection of ground water controlling systems

**Operational Activities**

**UM Energy Management Steam Operations**
• **Organization and Tools**
  ◦ **Equipment Hierarchy**
    • Organized based on:
      1. Campus
      2. Common Grouping, such as Location, Equipment Class
  ◦ **Operations / Maintenance Based on 5 Human Senses**
    • No/little test equipment used by Craft
    • Paper WOs
    • Aging Work Force

**Equipment Hierarchy**

**Technology Based Tools**

**UM Energy Management Steam Operations**
• **Initiatives to Improve Steam Operations**
  
  ◦ **Consistent Work Order Processing Procedure**
    • Strengthen the CMMS
  
  ◦ **PM Optimization – Reliability Centered Maintenance (RCM) Approach**
    • Complete review of existing PM Program
    • New Metric
      ◦ PM Yield
        • # PM Identified Corrective Work Hrs / Total PM Hrs
      ◦ Mean Time Between Failure (MTBF)

---

**Repair** – Field Breakdown

**Corrective** – PM ID Repairs
FY 2013 Energy Management - Utilities - PM Yield

**Repair** – Field Breakdown
**Corrective** – PM ID Repairs

Based on SMRP Metric 5.4.12 - PM/PdM Yield:

**High Reliability**
- > 0.8 - Review for Redesign possibilities
- 0.6 to 1.0 - Monitor PM Program
- < 0.6 - Review for PM Optimization

**Low Reliability**
- > 0.6 - Potential Infant mortality, Review maintenance practices, Redesign possibilities
- 0.6 to 1.0 - Review PM work, Reliability Centered Maintenance Evaluation, Redesign possibilities
- < 0.6 - Review PM work, Reliability Centered Maintenance Evaluation
• Initiatives to Improve Steam Operations
  ◦ Consistent Work Order Processing Procedure
    • Strengthen the CMMS
  ◦ PM Optimization – Reliability Centered Maintenance (RCM) Approach
    • Complete review of existing PM Program
    • New Metric
      ◦ PM Yield
        • # PM Identified Corrective Work Hrs / Total PM Hrs
      ◦ Mean Time Between Failure (MTBF)

Initiatives - Operations and Reliability

UM Energy Management Steam Work Management
Enterprise Asset Management (EAM) Project
From Accounting Based Maintenance System to Asset Management System

- Current Computerized Maintenance Management System (CMMS) is no longer supported
- Completing Visioning Phase in Mar 2013
- Develop / Documenting Business Processes
- To include all 5 UM Campuses

District Wide Initiatives
Group Discussion Topics

Reliability Metrics

Operational Activities

Equipment Hierarchy Organized Technology Based Tools

Initiatives - Operations and Reliability

District Wide Initiatives

Discussion Topics