Progress Report

Nestle Purina Team 2

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Overview of Presentation

- **Review of problem statement**
- **Operation of dryer**
- **Current situation**
- **Future tasks**
- **Gantt Chart**

Introduction

- ## Problem
  - **Dryer 3 uses significantly more energy than the other four dryers to extract moisture from the product.**

Introduction

- **Needs statement**
  - **Propose a solution to current throughput and energy efficiency issues.**

- **Goal**
  - **Increase η in dryer 3**

- **Constraints**
  1. **Moisture Content in the product < 11.5%**
  2. **Payback period for investment < 8 years**
  3. **There is no condensation in the steam coils**

Functional Diagram
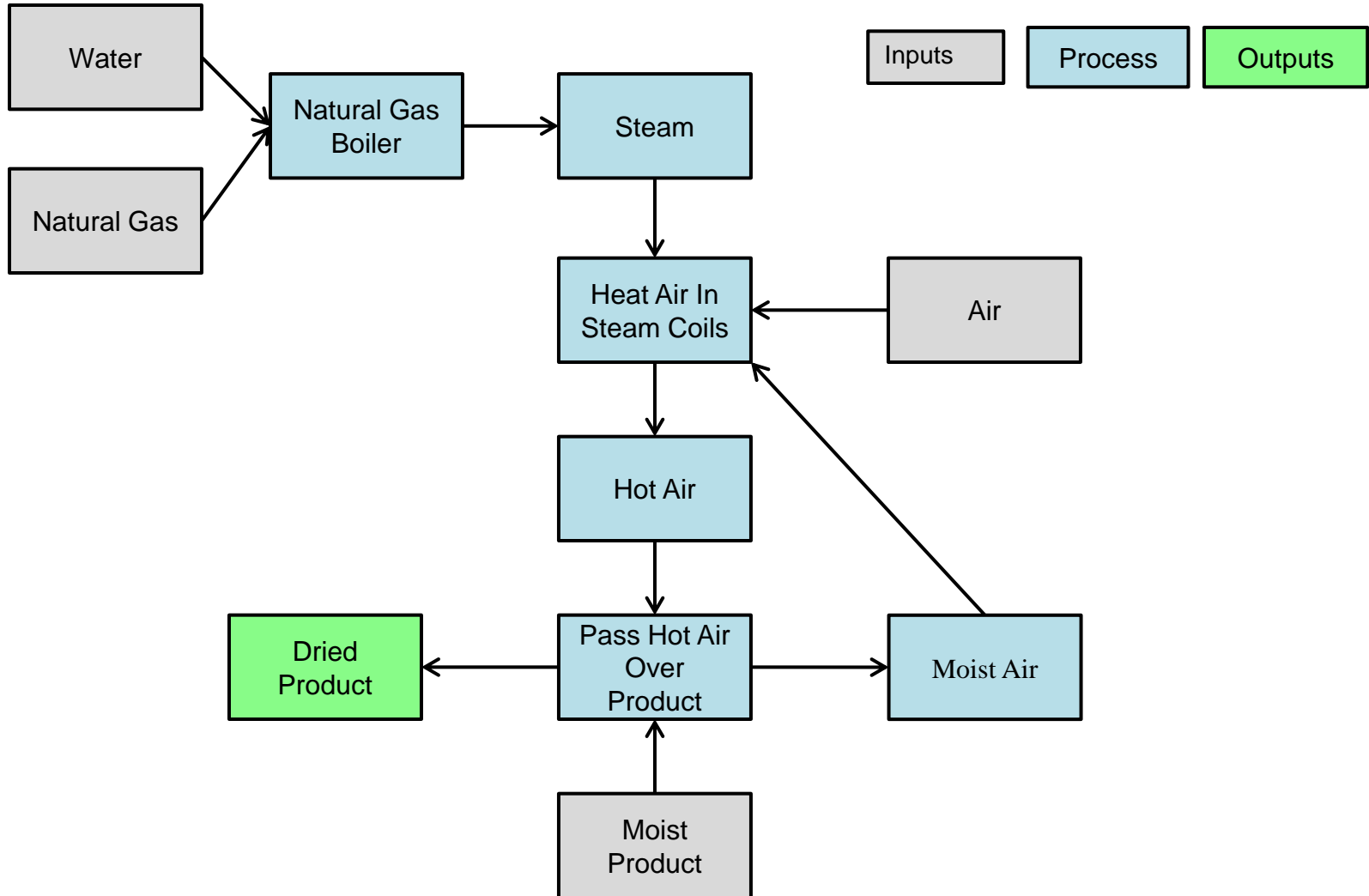
What We Have Done

- **Using thermodynamics and heat transfer to determine:**
  - **Flow rate of steam**
  - **Efficiency compared to other dryers**
    - **34.7 % less inch food per steam flow rate**
  - **Relative humidity (moisture control)**
  - **Where largest losses occur**
    - **Steam traps**
    - **Heat exchangers**

Current Situation

- **Natural gas conversion**

- **Previously planned on building a prototype**

- **Prototype model abandoned**
  - **Develop a heat transfer / thermofluid model to define the existing steam model**
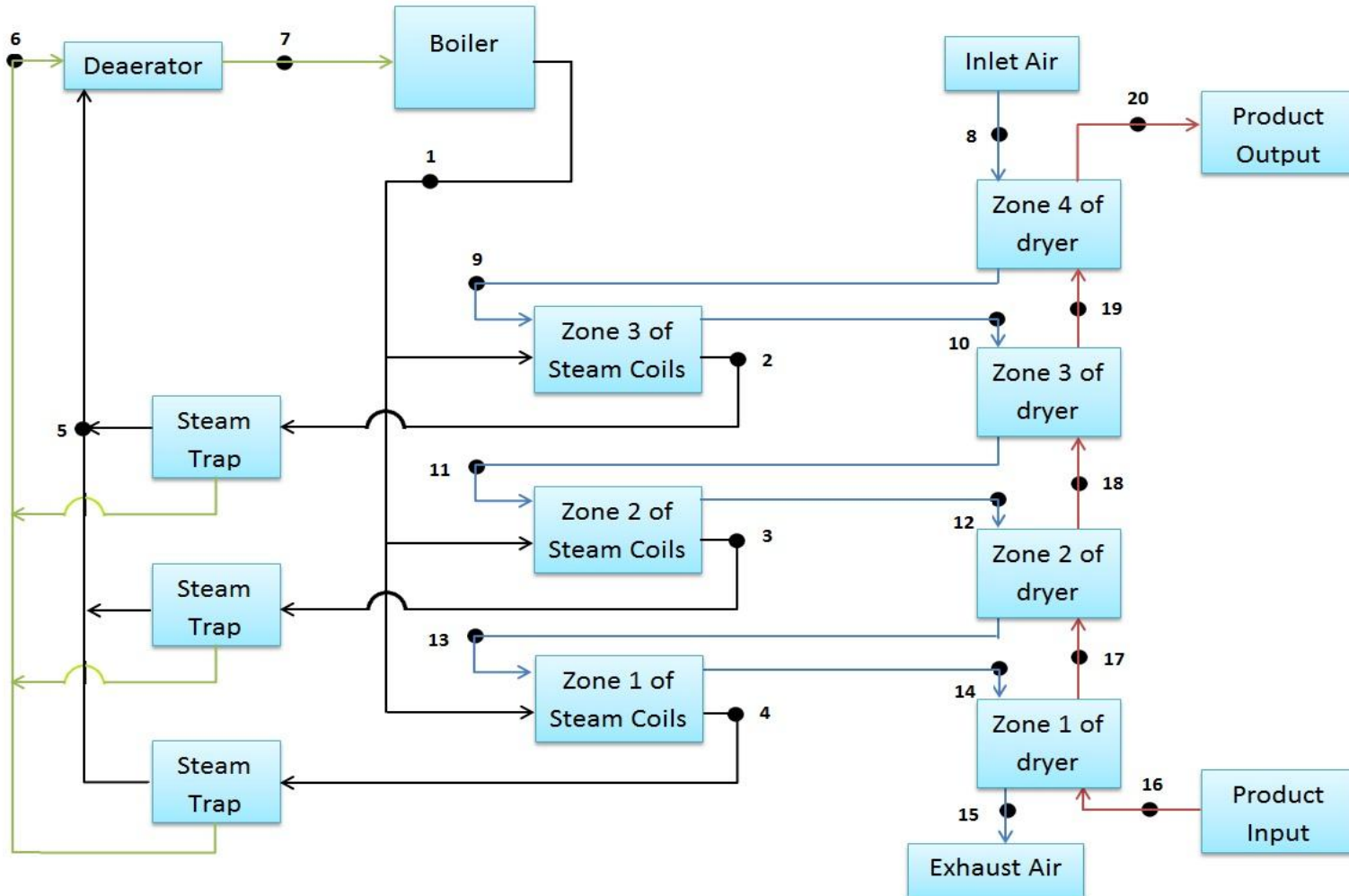
Thermodynamic Model

Dryer 3

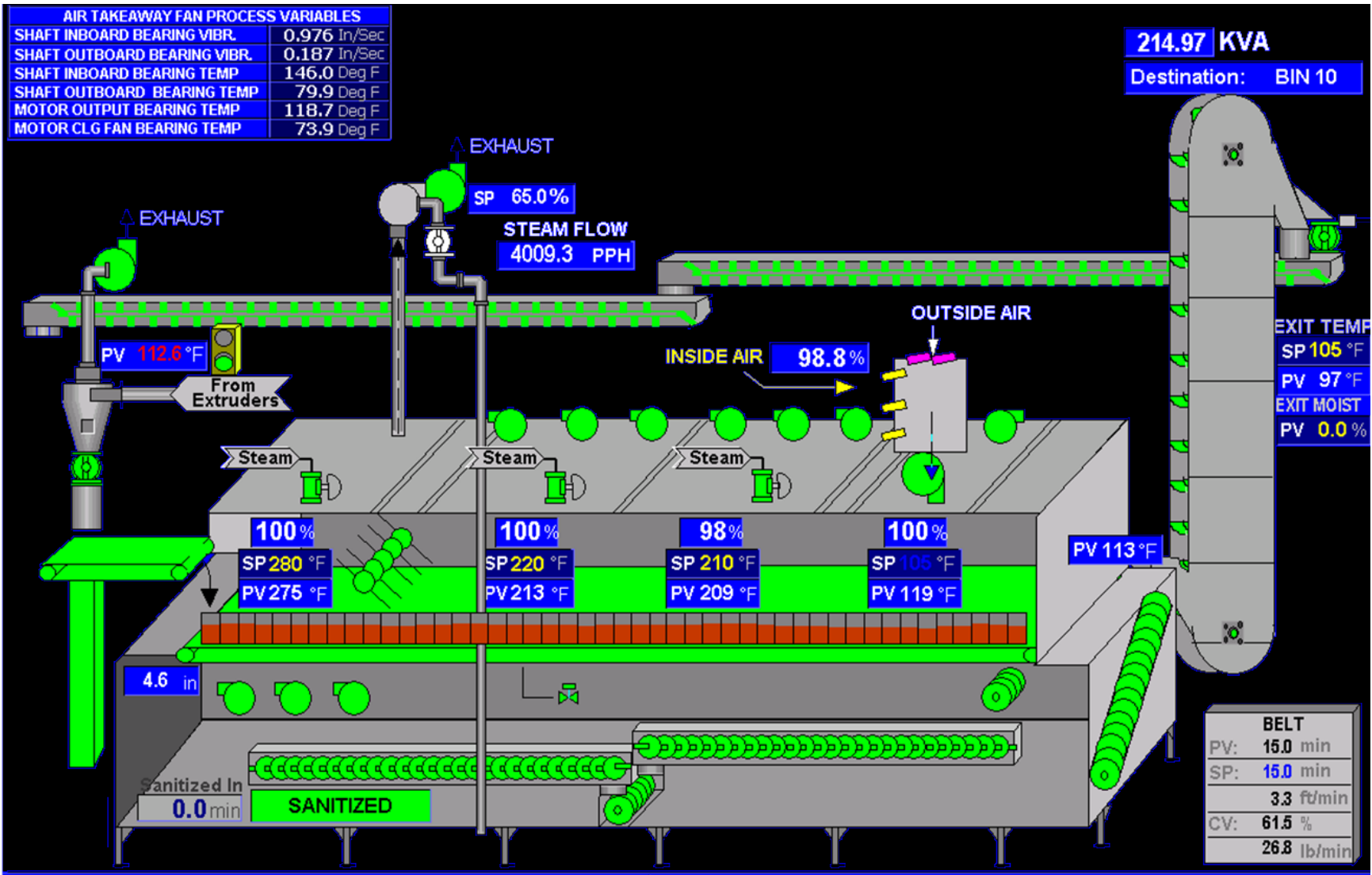Nestle Purina iFix Interface

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Future Plans

- Work with Nestle Purina to fully define the existing steam and natural gas dryers in the plant

- Use numerical modeling to show that natural gas is more efficient
  - Flowmaster V7 General Systems

- Verify our numerical model using current data

- Design a modified natural gas dryer and analyze it using our numerical model

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Existing Dryer Model

Steam Line — Existing

Air Flow — Existing
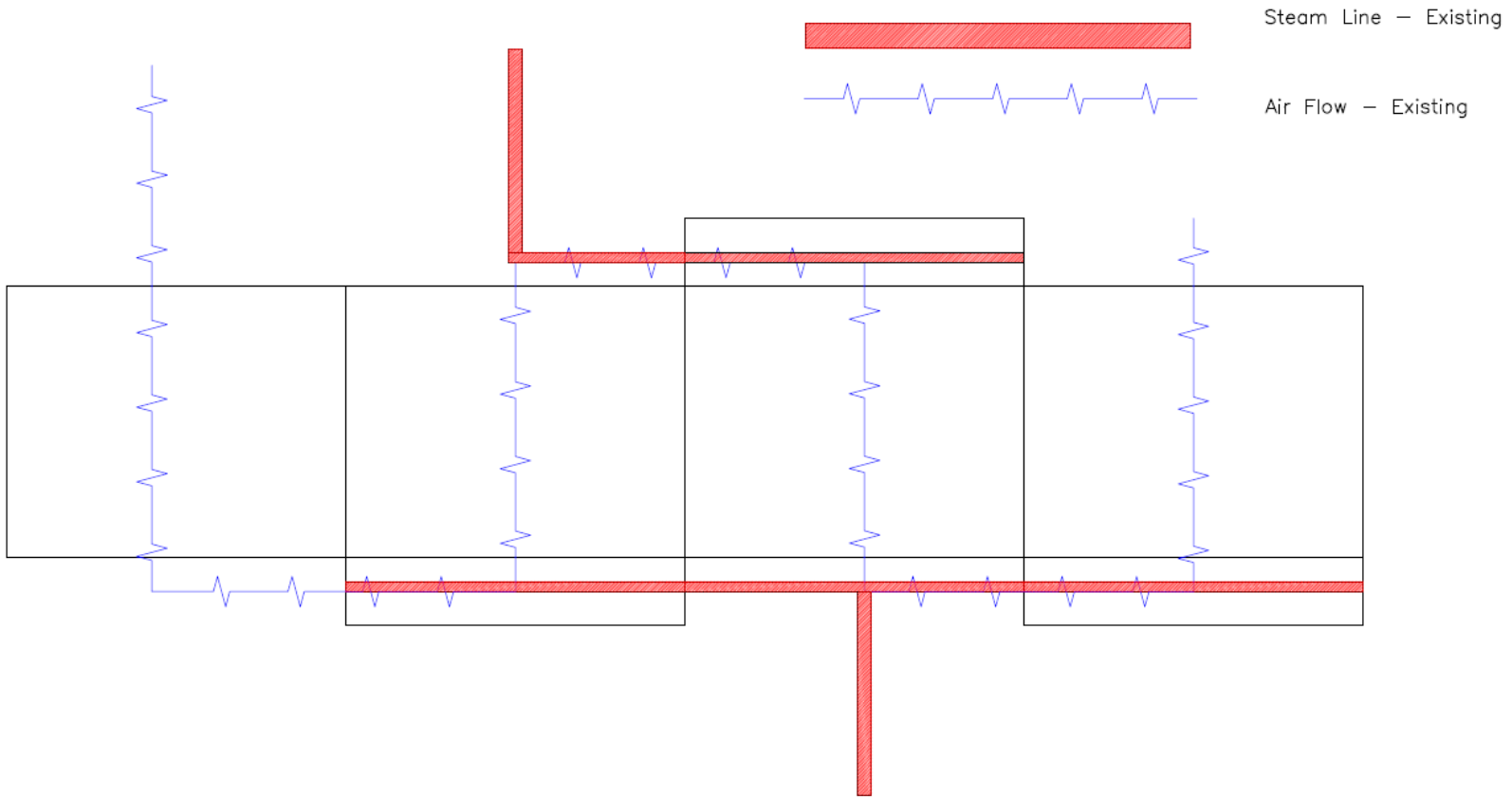
Spring Semester Gantt Chart
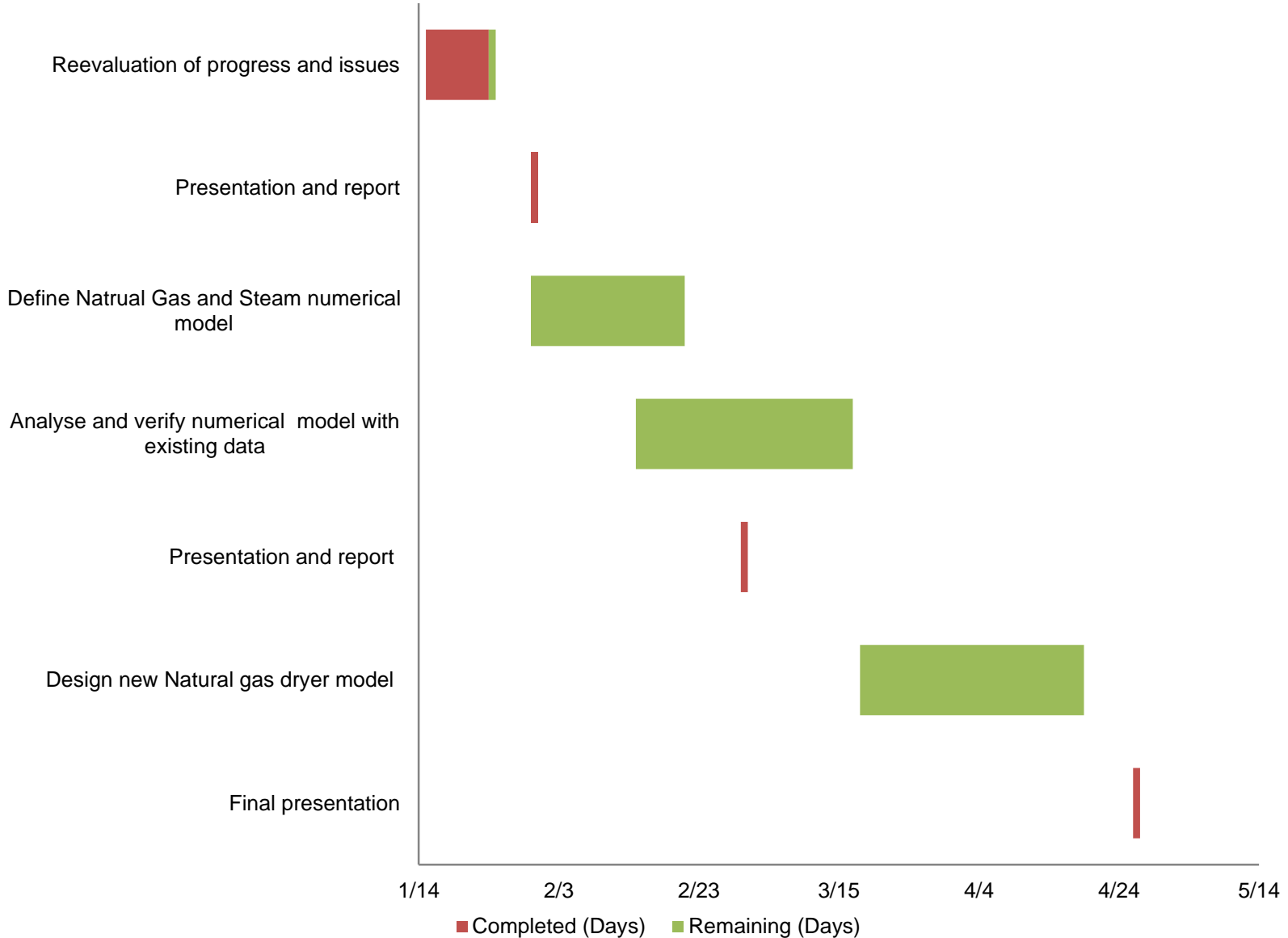
Conclusion

- **Dryer efficiency improvement**

- **Initial plan**
  - **Construction of prototype**
  - **Compare steam to natural gas**

- **Numerical simulation**
  - **Steam model**
  - **Natural gas model**
  - **Flowmaster software**

References

- **Clint Chadwick**
  - **Environmental Coordinator**
  - **Nestle Purina Pet Care, Flagstaff, AZ**

- **Chad Girvin**
  - **Processing Maintenance Team Leader**
  - **Nestle Purina Pet Care, Flagstaff, AZ**

- **Buhler Aeroglide Natural Gas Dryer**
  - **http://www.aeroglide.com/snack-dryers-roasters-ovens.php**