1. Background
- Gasoline blending system: blends different hydrocarbons to produce desired gasoline grades.
- Functions of Pump 367: a) pumping blending components to destination tanks b) circulating blend to achieve thorough mixing.

2. Objective
Developing a dataset of P367 to assist the company purchase a spare pump to lower the risk of system failure.

3. Methodology
- Developing pressure loss calculation models to obtain system curves for both blending and circulation modes.
- Intersecting system curves with pump characteristic curve to find out system operating points.

4. Results
- • Blending mode: Flow $F_b$, Liquid head $h_b$.
- • Circulation mode: Flow $F_c$, Liquid head $h_c$.
- • $\Delta P_{\text{NPSH}}$ lower than 7.5 m to avoid cavitation.
- • $h_b$ for blending and circulation modes respectively.

5. Conclusions
- The pump operates over a flowrate range from $F_b$ to $F_c$.
- Liquid heads generated are $h_b$ and $h_c$ for blending and circulation modes respectively.
- Since the minimum NPSHA is 7.5 m, pump manufacturer should design a pump with NPSHR lower than 7.5 m to avoid cavitation.
- Maximum power requirement is lower than the power provided by the current motor. The motor can still be used to drive the spare pump to be purchased.

6. Cost and benefit analysis
- Easy to implement, low cost & short payback.
- Highest net profit increase.

7. Conclusions
- Hydraulic fouling in E1613A&B constrained capacity.
- Different rectification methods are proposed to reduce the total pipeline pressure loss and increase the unit to its design capacity.

8. Recommendations
- Short-term solution: bypassing HX using 20mm flanges.
- High cost & long implementation time.

Task 2: Increasing HDS unit capacity

4. Cause of constraint
- Measured pressure drop: design pressure drop across E1613A&B.
- Hydraulic fouling in heat exchangers E1613A&B.

5. Rectifications
- Option 1: Cleaning E1613A&B: unit shutdown = long payback period.
- Option 2: Using available 20mm flanges: capacity increases by 50t/d.
- Option 3: Installing 40mm flanges by hot tapping: capacity increases by 100t/d.

6. Cost and benefit analysis
- Easy to implement, low cost & short payback period.
- Low net profit increase.
- Long-term solution: bypassing HX by installing 40mm flanges.
- High cost & long implementation time.
- Highest net profit increase.

Task 3: Improving gasoline blending efficiency

4. Conclusions and recommendations
- Modifications: a) Introducing built-in equations to the current control system to calculate the amount of LPG based on volumetric flow rate measured b) Monitoring the vapour pressure inside the tank based on component vapour pressure and volume fraction.
- Safety concern: floating roof damage.

References