# Summary Report for Task-2

## Column Analysis:

The dataset comprises multiple columns providing detailed information about machinery maintenance and service calls. Key columns include:

1. Primary Key (Order Date): Unique identifier for each service record
   - Data Type: String
   - Provides chronological tracking of service events
2. Product Category:
   - Primarily "SPRAYS" with one "BALER" entry
   - Indicates product line diversity

3. Complaint Column:
   - Free-text description of reported issues
   - Highlights specific machine problems
   - Varied in length and detail

4. Cause Column:
   - Explanations for reported complaints
   - Provides root cause information
   - Demonstrates manufacturing or operational challenges

5. Correction Column:
   - Detailed service and repair actions

- Describes resolution steps
- Offers insights into maintenance procedures

**Data Cleaning Summary:**

Cleaning Approach:

- Handled missing values through contextual analysis
- Standardized categorical entries
- Removed potential duplicate entries
- Corrected inconsistent capitalization
- Validated data integrity across columns

Key Cleaning Actions:

- Normalized text fields
- Removed redundant whitespaces
- Standardized date formats
- Ensured consistent terminology
- Addressed potential data entry errors

**Visualizations:**

Recommended Visualizations:

1. Product Category Distribution
   - Pie chart showing service call distribution
   - Highlights predominance of SPRAYS category
2. Root Cause Analysis
   - Bar graph depicting frequency of different root causes

- Identifies most common maintenance issues

3. Monthly Service Call Trends
   - Line graph showing service calls over time
   - Reveals seasonal maintenance patterns
4. Repair Action Breakdown
   - Stacked bar chart of fix conditions
   - Illustrates primary repair strategies
5. Component Failure Frequency
   - Horizontal bar chart of most problematic components
   - Provides insights into recurring mechanical issues

**Generated Tags & Key Takeaways:**

Generated Tags:

- Manufacturing Quality Indicators
- Component Failure Modes
- Maintenance Action Categories
- Service Call Characteristics
- Repair Complexity Levels

Key Takeaways:

1. Manufacturing Insights:
   - Recurring issues with fastener tightening
   - Potential quality control gaps in production

- Consistent problems with installation processes

2. Maintenance Observations:
   - Frequent hydraulic and oil-related issues
   - Significant focus on retightening and reinstallation
   - Complex repair processes requiring multiple steps

3. Product Reliability:
   - Challenges with sensor and connector installations
   - Consistent need for post-manufacturing adjustments
   - Opportunities for design and quality improvement

4. Operational Recommendations:
   - Implement more rigorous pre-delivery inspections
   - Develop standardized installation checklists
   - Enhance worker training on critical assembly steps

5. Economic Implications:
   - Potential cost savings through proactive quality control
   - Reduced service call expenses
   - Improved customer satisfaction through reliability

**Limitations and Future Work:**

- Expand dataset for more comprehensive analysis
- Develop predictive maintenance models
- Implement machine learning for automated tag generation

The analysis provides a holistic view of machinery maintenance, offering actionable insights for engineering and quality improvement teams.