Donner Q4-Q5 Analysis

Donner Company - Questions 4 & 5 Analysis

TOM Case 602-040

Question 4: Utilization Calculations

Part A: Labor Utilization for Overall Process (September 1987)

The Question

During September 1987, what was the labor utilization for the overall process?

Logic

Labor utilization measures how effectively the company uses its available workforce capacity. It's calculated as:

Labor Utilization = Actual Productive Hours / Total Available Hours

Data Sources

- **Actual Productive Hours**: From Exhibit 2, bottom of page 9
- **Total Available Hours**: Calculate from workforce size × hours × days

Calculations

Step 1: Identify Actual Productive Hours

From Exhibit 2 - September's Standard Production:

```
Total Standard Production Hours = 1,535.9 hours
```

Step 2: Calculate Total Available Hours

```
Number of employees = 22 (stated in case text)
Hours per day = 8 hours
Working days in September = 22 days (standard month)
```

```
Total Available Hours = 22 employees × 8 hours/day × 22 days
Total Available Hours = 3,872 hours
```

Step 3: Calculate Labor Utilization

```
Labor Utilization = 1,535.9 / 3,872
Labor Utilization = 0.397
Labor Utilization = 39.7%
```

Answer: Labor Utilization = 39.7%

Interpretation

- Only 39.7% of paid labor time was productive
- Over 60% of labor capacity was idle or wasted
- This explains low profitability (2.5% in September vs 10.25% in August)

Part B: Machine Utilization for Electroplate

The Question

What was the machine utilization for electroplate?

Logic

Machine utilization measures how much the electroplate equipment was actually used versus its available capacity:

Machine Utilization = Actual Machine Hours Used / Total Available Machine Hours

Data Sources

- **Actual Hours Used**: From Exhibit 2, Electroplate row
- **Available Hours**: Single shift operation × working days

Calculations

Step 1: Identify Actual Electroplate Hours

From Exhibit 2 - Electroplate row:

```
Total Electroplate Hours = 127.0 hours
```

Step 2: Calculate Available Machine Hours

```
Hours per day = 8 hours (single shift)
Working days in September = 22 days

Available Machine Hours = 8 hours/day × 22 days
Available Machine Hours = 176 hours
```

Step 3: Calculate Machine Utilization

```
Machine Utilization = 127.0 / 176
Machine Utilization = 0.722
Machine Utilization = 72.2%
```

Answer: Electroplate Machine Utilization = 72.2%

Interpretation

- Electroplate is much better utilized than labor (72.2% vs 39.7%)
- At 72.2%, electroplate is approaching bottleneck status
- This aligns with case observation about shifting bottlenecks

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Question 5: Problem Identification

The Question

What are the discernible problems facing Donner?

Logic for Problem Identification

Problems are identified by analyzing:

1. **Quantitative metrics** showing poor performance
2. **Qualitative observations** from management
3. **Operational inefficiencies** described in the case
4. **Comparative performance** (August vs September)

Identified Problems

Category 1: OPERATING PROBLEMS

1. Unpredictable Bottlenecks

- **Evidence**: "The production bottleneck shifted almost daily from one operation to another, without pattern"

- **Impact**: Cannot plan capacity or scheduling effectively

2. Quality Failures

- **Evidence**: Customer returns increased from <1% to 3%
- **Calculation**: 3x increase in defect rate
- **Impact**: Rework costs, customer dissatisfaction

3. Late Deliveries

- **Evidence**: Averaging 9 days late (case states 10, 8, and 9 days for Aug/Sept/Oct)
- **Promise**: 3 weeks for <1,000 boards
- **Impact**: Risk losing customers to competitors

4. Low Productivity

- **Evidence**: Labor utilization only 39.7% (calculated above)
- **Benchmark**: Should be >70% for profitable operations
- **Impact**: High labor cost per unit

5. Inefficient Work Methods

- **Evidence**: Plater walks 18 feet repeatedly, wastes 15% of time
- **Calculation**: 0.15 × 8 hours = 1.2 hours/day wasted
- **Impact**: Reduced capacity at potential bottleneck

Category 2: MANAGEMENT PROBLEMS

6. Poor Scheduling Visibility

- **Evidence**: "Flaherty delayed scheduling for several days until raw material arrived"
- **Impact**: Cannot optimize workflow or predict bottlenecks

7. Inadequate Worker Training

- **Evidence**: 8 workers hired in August, need "three more months to become skilled"
- **Timeline**: Hired August, still learning in October
- **Impact**: Lower productivity, quality issues

8. No Standardized Quality Requirements

- **Evidence**: "Standards varied from customer to customer and even order to order"
- **Example**: Same customer accepted scratched boards but rejected boards with tiny nicks
- **Impact**: Inconsistent production, unexpected rework

9. Incomplete Operations

- **Evidence**: 6% of September production had incomplete operations
- **Calculation**: From 7% reject rate - 1% total loss = 6% rework
- **Impact**: Double handling, delayed shipments

10. End-of-Month Shipping Syndrome

- **Evidence**: Exhibit 5 shows $44,560 shipped on Sept 30 vs average ~$4,000/day
- **Pattern**: Minimal shipments first half, rush at month-end
- **Impact**: Uneven workflow, overtime costs, quality risks

Summary of Key Metrics

Metric	Value	Benchmark	Gap
Labor Utilization	39.7%	>70%	-30.3%
Machine Utilization (Electroplate)	72.2%	<85%	Approaching limit
On-Time Delivery	-9 days	0 days	9 days late
Quality (Returns)	3%	<1%	2% excess
Rework Rate	6%	<2%	4% excess
Net Profit Margin	2.5%	10%+	-7.5%

Root Cause Analysis

Primary Root Cause: **Poor Production Planning**

- No advance scheduling (wait for materials)
- No load balancing across operations
- No systematic approach to order routing

Secondary Root Causes:

1. **Inadequate Information Systems** - No visibility into WIP or bottlenecks
2. **Workforce Issues** - Untrained workers, constant reassignments
3. **Policy Problems** - CNC drill underutilized (100-board rule too high)

Analysis prepared for TOM Class 2: Donner Company
Date: 2025-09-10

Anticipated Professor Questions & Responses

Based on RC TOM Course Themes: Business/Operating Model Alignment, Process Analysis, Managing Complexity & Uncertainty

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Question 1: Business Model Alignment

"How well does Donner's operating model align with their business model of specialized, small-batch PCB production?"

Expected Response:
Misalignment is the core problem. Donner promises quick turnaround on small, complex orders (business model) but operates with:

- **Setup-heavy processes** that penalize small batches (25 min electroplate setup for any size)
- **Inappropriate decision rules** (CNC at 100 boards when breakeven is 6)
- **No differentiation by order type** - Arthur Dief's success with ≤8 board orders shows specialized processes work

Key Insight: Their operating model is designed for volume manufacturing, not their actual niche of prototype/pilot production. This violates the fundamental TOM principle of alignment between business and operating models.

Question 2: Process View & Interdependencies

"Using the 'process view' lens we discussed, where do you see interdependencies creating problems at Donner?"

Expected Response:
The lack of process view thinking creates cascading problems:

1. **Information Flow Breakdown**: Flaherty waits for materials before scheduling → can't anticipate bottlenecks
2. **WIP Accumulation**: Two storage points (after drilling, after electroplate) create unpredictable queues
3. **Resource Conflicts**: Workers shifted mid-task → expedited orders arrive at empty drilling stations
4. **End-to-End Visibility**: No one owns the complete process → 6% incomplete operations

Application of Course Concept: Donner lacks what we call "process thinking" - understanding how decisions at one step affect the entire system. The drill decision at step 6 impacts all 18 downstream steps.

Question 3: Managing Variability & Uncertainty

"How should Donner manage the extreme variability in their order sizes (1 to 1,050 boards)?"

Expected Response:
Following our framework for managing variability - either **reduce it** or **accommodate it**:

Option 1: Reduce Variability

- Reject orders outside target range (e.g., 10-100 boards)
- Standardize on specific board types
- Problem: Conflicts with their differentiation strategy

Option 2: Accommodate Variability (Recommended)

- **Segmented processes** by order size (like Toyota's mixed-model lines)
- **Dedicated cell for ≤30 boards** (extend Arthur Dief's model)
- **Dynamic routing rules** based on total work content, not just board count
- **Flexible capacity** through cross-training (already have this)

Key Learning: High variety requires fundamentally different operating models - you can't efficiently process 1-board and 1,000-board orders through the same system.

Question 4: Metrics & Performance Assessment

"What metrics would you implement to manage Donner's operations, and why?"

Expected Response:
Current metrics are purely financial (profit margin). Need operational metrics that link to financial performance:

Leading Indicators (Predictive):

1. **Setup time ratio** = Setup time / Total production time (currently hidden)
2. **Order cycle time by size category** (not averaged across all orders)
3. **First-pass yield** by operation (distinguish defects from incomplete)

Real-Time Metrics:
4. **WIP by operation** (identify emerging bottlenecks)
5. **Machine/labor utilization** by hour (not monthly averages)

Why These Matter:

- Setup ratio directly drives profitability on small orders
- Cycle time predicts delivery performance
- Real-time WIP prevents the "wandering bottleneck"

This follows our "Linking Metrics" framework - operational metrics must connect to financial outcomes.

Question 5: Continuous Improvement

"If you were implementing continuous improvement at Donner, where would you start and why?"

Expected Response:
Apply the Toyota Production System principles, but adapted for high-mix/low-volume:

Phase 1: Make Problems Visible (Weeks 1-2)

- **Visual management board** showing hourly WIP at each station
- **Andon system** - operators signal when approaching capacity
- **Standard work** documentation (currently nonexistent)

Phase 2: Eliminate Waste (Weeks 3-4)

- **Motion waste**: Plater walking 18 feet → relocate desk next to tanks (save 15%)
- **Waiting waste**: Materials arriving before scheduling → implement pull system
- **Defect waste**: Separate true defects from incomplete operations in tracking

Phase 3: Build Learning Loops (Ongoing)

- **Daily huddles** to discuss yesterday's bottleneck
- **A3 problem-solving** for recurring issues
- **Kaizen events** for setup reduction

Critical Insight: Start with visibility. You can't improve what you can't see, and Donner's #1 problem is they don't know where their bottlenecks are until it's too late.

Connection to Course Themes

These questions directly map to Module 1 concepts:

- **Process Analysis**: Identifying bottlenecks, calculating capacity
- **Operating Model Design**: Matching structure to strategy
- **Performance Metrics**: Connecting operational to financial metrics

- **Managing Complexity**: Handling variety in order sizes
- **Continuous Improvement**: Making problems visible, eliminating waste

The Donner case exemplifies the core TOM challenge: **achieving operational excellence while maintaining strategic flexibility** in an uncertain environment.