Raw Materials Inspection

Round 5:

Warehouse	Obsoletes value per week	Forecast error (MAPE)	Bias	Production batches	Start up productivity loss per batch (value)	Rejects (value)
DC Netherlands						
Fressie Orange 1 liter		49.0%	0.0%	25.9	€ 1,893	€ 1,192
Fressie Orange/Mango 1 liter		50.9%	0.1%	13.0	€ 1,065	€ 1,059
Fressie Orange/C-power 1 liter		60.6%	0.3%	13.0	€ 1,047	€ 821
Fressie Orange PET		47.1%	0.0%	26.0	€ 3,458	€ 1,719
Fressie Orange/Mango PET		51.7%	-0.1%	13.0	€ 1,866	€ 1,662
Fressie Orange/C-power PET		58.4%	-0.2%	13.0	€ 1,926	€ 1,296

Raw materials inspection was implemented in Round 5 to reduce rejection rates of finished products and improve overall production stability. Inspections were applied to key raw materials, including **Orange (Arancia d'Espana), Mango (Dalima Mango), and PET bottles (Phily Jones Plastics)**.

Improving input quality helped decrease breakdowns at the bottling lines and reduced the number of rejected finished products. Supplier selection decisions further supported this improvement by increasing the overall quality of incoming materials.

Raw materials inspection for **Orange** Arancia d'Espana, **Mango** Dalima Mango, and **PET bottle** Philyp Jones Plastics.

Benefits:

- Reduced bottling line breakdowns.
- Lower rejection rates for finished products.
- Improved production reliability.

Tradeoffs:

- Increased labor requirements by approximately 6 additional hours per round (around 2 hours per order line).

- However, with 3 warehouse employees available (120 total labor hours), the additional workload did not create a labor constraint or burden on warehouse operations.

Rounds 6 - 8:

Raw materials inspection was maintained for **mango, orange, and PET bottles**, with **Vitamin C** added to further improve input quality and production consistency.

Intake Time Warehouse

Round 5:

In Round 5, after reviewing updated supplier decisions from VP Purchasing, it became clear that average supplier lead times had decreased. At the same time, inbound labor analysis showed opportunities to smooth labor demand.

As a result, the inbound warehouse intake time was **increased from 5 to 7 days**, allowing deliveries to be processed over a longer period rather than concentrated in short peaks.

Benefits:

- Lower peak inbound labor requirements.
- Reduced reliance on flexible labor over time.
- More stable and predictable inbound warehouse operations.

Tradeoffs:

- Larger reorder points and order-up-to quantities.
- Slightly higher exposure to stock-out risk.

However, because total lead time remained stable or decreased due to improved supplier performance, the increased intake time did not materially increase inventory risk or negatively impact stock availability.

Rounds 6 - 8:

Supplier lead times remained largely unchanged, so the 7-day intake time was maintained.

Inflate PET Bottles

Inflatable PET bottles were implemented from rounds 5 - 8 to reduce warehouse space requirements and lower labor costs associated with handling packaging materials. This decision required an annual cost of €140,000, equivalent to €70,000 per round, along with a one-time investment of €700,000.

Benefits:

- PET costs approximately 50% less than finished PET bottles.
- Preforms occupy only 10% of the space of finished bottles.
- Resulted in approximately 90% fewer pallet locations, significantly reducing warehouse labor requirements.

Based on space calculations, pallet capacity requirements were reduced from 850 to 170 pallet locations.

As a result, warehouse capacity costs were reduced by approximately €68,000, which helped offset the additional costs associated with PET bottle inflation.

Finished Goods Warehouse

From rounds 5-8, the finished goods warehouse was outsourced to reduce fixed warehousing costs and increase flexibility as demand and inventory levels fluctuated.

Rationale for outsourcing:

- Eliminate pallet location costs.
- Remove internal handling costs.
- Reduce the need to precisely forecast finished goods warehouse capacity.

Under the outsourced model, costs consisted of:

- $1.50 per pallet location per day.
- $1.00 intake fee per pallet.
- $2.50 dispatch fee per order line.

By outsourcing, storage and distribution activities were consolidated at a Multi-Client Center (MCC), where logistics operations from multiple manufacturers are combined. This consolidation enabled more efficient distribution and resulted in an estimated 5% reduction in outbound distribution costs.

Lower distribution costs benefited customers directly and supported an increase in the customer contract index of up to 5%.

The MCC partnership incurred a cost of $10,000 per annum, equivalent to $5,000 per round.

MCC Partner Selection: Yogurt Drink Manufacturer

A yogurt drink manufacturer was selected as the MCC partner due to strong operational compatibility.

- Compatibility: High. Yoghurt drinks, like orange juice, require refrigeration and have similar shelf life considerations. This compatibility in storage requirements can lead to efficiencies in refrigeration logistics and cost-sharing.
- Cross-Promotion Potential: High. Both products target consumers interested in healthy, perishable food options. There's potential for joint marketing initiatives that could benefit both parties.
- Logistics Synergy: High. Both products would likely follow similar distribution channels to supermarkets, health food stores, and other retail outlets that specialize in refrigerated goods.

Number of Employees in the Intake Warehouse

A review of inbound warehouse labor utilization showed that weekly working hours consistently remained below 80 hours, indicating excess staffing capacity.

Based on this observation, the number of permanent inbound warehouse employees was gradually reduced without creating a labor constraint:

Round 5: Reduced staffing from 5 to 3 employees.

Round 6: Further reduced staffing to 2 employees.

Rounds 7 - 8: Reduced staffing to 1 employee.

These adjustments aligned staffing levels with actual workload requirements, allowing labor costs to be reduced while maintaining stable inbound warehouse operations.

Bottling and Mixing lines

The existing mixer was retained after evaluating alternative options. Key factors considered in the mixer decision included:

- Technical minimum and maximum batch capacity.
- Investment and annual operating costs.
- Run time and cleaning time per batch.

A comparison of the available mixers showed that switching mixers would require a higher investment without providing meaningful operational advantages for the current production requirements.

	Fruitmix MQ	**Megachurn 20**
Technical batch range	8,000	15,000
Investment and yearly cost	312,500 + 62,500/year	375,000 + 75,000/year
Run time per batch	2.0	2.0
Cleaning time	2.0	2.0

Bottling Line Selection

The bottling line was changed from Swiss Fill 2 to MultiFlex 1 to better support operational flexibility and reduce production risk.

Although the TopSpeed bottling line offered higher throughput, it was not selected due to its narrow tolerances, which require packaging materials to meet specifications exactly. According to technical documentation, deviations in material quality could lead to severe breakdowns, making the line unsuitable given the existing variability in packaging inputs.

The MultiFlex 1 bottling line was selected instead due to:

- Wider tolerances to packaging material variability.
- Shorter changeover times.
- Greater flexibility across different product configurations.

This selection reduced the risk of breakdowns and supported more stable production while maintaining adequate capacity.

Solve Breakdown Trainings

Solve Breakdown training was implemented and maintained for Rounds 5 - 8 to reduce the duration of equipment breakdowns and improve overall production reliability. This action supported faster issue resolution at the bottling lines and contributed to more stable production plan adherence during Phase 2.

Preventive Maintenance

Preventive maintenance was not implemented during Rounds 5 - 6, as breakdown levels were manageable under existing operating conditions. Beginning in Rounds 7 - 8, a limited level of preventive maintenance was introduced to further reduce breakdown frequency and support production stability during the later stages of the simulation.