Leveraging information for smarter decision-making, resource optimization and supply chain excellence

Kuah Ann Thye
IBM-ILOG WebSphere
Agenda

1. Illustrate Use Case of Optimisation
2. Share ILOG Optimisation Tools
3. Share ILOG Optimisation Platforms
4. Share ILOG Optimisation Packages
**What is Optimization?**  
Maximize resource efficiency

<table>
<thead>
<tr>
<th>Resources</th>
<th>Examples of choices to make</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital</td>
<td>Allocate</td>
</tr>
<tr>
<td>People</td>
<td>Acquire, schedule, assign, train</td>
</tr>
<tr>
<td>Time</td>
<td>Allocate</td>
</tr>
<tr>
<td>Equipment</td>
<td>Acquire, schedule, locate</td>
</tr>
<tr>
<td>Facilities</td>
<td>Locate, schedule</td>
</tr>
<tr>
<td>Vehicles</td>
<td>Acquire, route, schedule</td>
</tr>
<tr>
<td>Raw Material</td>
<td>Acquire, assign</td>
</tr>
</tbody>
</table>

Used to answer questions starting with ‘How many/much?’, ‘Who?’, ‘When?’, ‘Where?’, ‘Which?’
# Optimization Benefits

Documented ROI of INFORMS Edelman finalists using ILOG Products

<table>
<thead>
<tr>
<th>Company</th>
<th>Project Description</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Chilean Forestry firms</td>
<td>Timber Harvesting</td>
<td>$20 mil/yr + 30% fewer trucks</td>
</tr>
<tr>
<td>UPS</td>
<td>Air Network Design</td>
<td>$87m/2yrs + 10% fewer planes</td>
</tr>
<tr>
<td>South African Defense</td>
<td>Force/Equip Planning</td>
<td>$1.1 bil/year</td>
</tr>
<tr>
<td>Motorola</td>
<td>Procurement Mgmnt</td>
<td>$100-150 mil/year</td>
</tr>
<tr>
<td>Samsung Electronics</td>
<td>Semiconductor Mfg</td>
<td>50% reduction in cycle time</td>
</tr>
<tr>
<td>SNCF (French RR)</td>
<td>Scheduling &amp; Pricing</td>
<td>$16m/yr rev + 2% lower op ex</td>
</tr>
<tr>
<td>Continental Airlines</td>
<td>Crew Re-scheduling</td>
<td>$40 mil in one year</td>
</tr>
<tr>
<td>AT&amp;T</td>
<td>Network Recovery</td>
<td>35% reduction spare capacity</td>
</tr>
<tr>
<td>Grant Mayo van Otterloo</td>
<td>Portfolio Optimization</td>
<td>$4 mil/year</td>
</tr>
</tbody>
</table>
## Optimization-based Applications

<table>
<thead>
<tr>
<th>Industrial</th>
<th>Transportation &amp; Logistics</th>
<th>Financial Services</th>
<th>Utilities, Energy &amp; Natural Resources</th>
<th>Telecom</th>
<th>Multiple/Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production planning &amp; scheduling</td>
<td>Yield Management</td>
<td>Portfolio optimization</td>
<td>Unit commitment</td>
<td>Network capacity planning</td>
<td>Workforce scheduling</td>
</tr>
<tr>
<td>Inventory optimization</td>
<td>Asset Optimization</td>
<td>Portfolio in-kindling</td>
<td>Supply portfolio planning</td>
<td>Routing</td>
<td>Advertising scheduling</td>
</tr>
<tr>
<td>Supply Chain Network Design</td>
<td>Fleet Assignment</td>
<td>Trade crossing</td>
<td>Power generation scheduling</td>
<td>Adaptive network configuration</td>
<td>Marketing campaign optimization</td>
</tr>
<tr>
<td></td>
<td>Depot &amp; warehouse location</td>
<td>Loan pooling</td>
<td>Distribution planning</td>
<td>Antenna and concentrator location</td>
<td>Revenue/Yield Management</td>
</tr>
<tr>
<td></td>
<td>Network design</td>
<td>Product/price recommendations</td>
<td>Water reservoir mgt</td>
<td>Equipment and service configuration</td>
<td>Appointment &amp; Field Service scheduling</td>
</tr>
<tr>
<td></td>
<td>Vehicle &amp; container loading</td>
<td></td>
<td></td>
<td></td>
<td>Combinatorial Auctions for Procurement</td>
</tr>
<tr>
<td></td>
<td>Vehicle routing &amp; delivery scheduling</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yard, Crew, Driver &amp; Maintenance scheduling</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From long term planning to operational scheduling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Let ILOG Show You How

- **Nissan**: increased productivity at Europe’s most efficient car production facility by 30%
- Chile's two largest forest-products companies reduced their truck fleets by 30% and saved $20 million annually
- **Samsung Electronics**: cut wafer-processing cycle time in half, to just 30 days
- **Continental Airlines**: responded to unexpected delays with efficient crew rescheduling, saving $40 million in one year
- **UPS**: cut package delivery costs by $87 million over 2 years and reduced its aircraft fleet by 10%
- A television network increased annual advertising revenue by $50 million
- An investment firm cut transaction costs by $100 million
- A major consumer packaged goods manufacturer dramatically increased the direct loading of trucks off its packaging lines
Benefits is substantial: ROA, OpEx, CapEx, Top Line

Documented ROI
INFORMS Edelman Award Finalists Using ILOG CPLEX

<table>
<thead>
<tr>
<th>COMPANY</th>
<th>BUSINESS PROCESS</th>
<th>ROI</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPS</td>
<td>Air Network Design</td>
<td>$87m/2yrs + 10% fewer planes</td>
</tr>
<tr>
<td>Motorola</td>
<td>Procurement Mgmt</td>
<td>$100-150 mil/year</td>
</tr>
<tr>
<td>Samsung Electronics</td>
<td>Semiconductor Mfg</td>
<td>50% reduction in cycle times</td>
</tr>
<tr>
<td>Continental Airlines</td>
<td>Crew Re-scheduling</td>
<td>$40 mil in one year</td>
</tr>
<tr>
<td>AT&amp;T</td>
<td>Network Recovery</td>
<td>35% reduction spare capacity</td>
</tr>
<tr>
<td>South African Defense</td>
<td>Force/Equip Planning</td>
<td>$1.1 bil/year</td>
</tr>
<tr>
<td>SNCF (French RR)</td>
<td>Scheduling &amp; Pricing</td>
<td>$1.1 bil/year</td>
</tr>
<tr>
<td>Grant Mayo van Otterloo</td>
<td>Portfolio Optimization</td>
<td>$4 mil/year</td>
</tr>
<tr>
<td>2 Chilean Forestry firms</td>
<td>Timber Harvesting</td>
<td>$20 mil/year + 30% fewer trucks</td>
</tr>
</tbody>
</table>
Top ILOG Optimization Industry Solutions

1. Industrial Production Planning & Scheduling
2. Travel & Transportation Yield Management & Asset Optimisation
3. Energy & Utilities Unit Commitment
4. Banking & Financial Markets Portfolio Optimization
5. Cross Industry Manpower
Optimisation Market Leadership

“ILOG is the world’s leading provider of software components”
6/99, 6/00
“The leading optimization component vendor is ILOG.”

"ILOG is the leading provider of optimization software components."
Larry Lapide, Research Director, AMR Research

"ILOG - The Optimizer Inside."
Byron Miller, Analyst, Giga Group
Industry Views …No 1 Optimisation since 80s

Optimization Technologies Evolution


- Primal Simplex LP
- CPM PERT
- Dispatch Rules
- Constraint Propagation
- Large MIPs
- Shifting Bottleneck
- Interior Point
- First CP Systems
- Global constraints
- Dual Simplex
- SA, GA, Tabu
- Constraint-based Scheduling
- Barrier LP
- Barrier Crossover
- Cooperating Solvers (MP/CP)
- Parallel Concurrent LP/MIP Scheduling
- Unified Object
- Model Parallel CP
- Single Modeling Language (MP,CP)

Pioneered by ILOG/CPLEX
ILOG: Leadership in Optimization

• Over 160 of the Global 500 build custom applications using ILOG Optimization engines and tools
  – 65% in Manufacturing, Transportation & Investment Management
  – 80 Manufacturers and 40 Transportation companies in the Global 2000

• Over 1,000 commercial customers under maintenance

• Major ISVs reach thousands of others
  – 8 of top 10 Supply Chain application vendors
  – SAP, Oracle, i2, Manugistics, Manhattan Associates, Infor, SSA Global, Quintiq, Kronos, Logic Tools, DynaSys, Ariba, SmartOps, Cadence Design, Siebel, Tavant, Siemens, Areva, Sabre, PROS, Emptoris, CombineNet, ITG, Eclipsys, SPSS, etc...

• Over 1,000 Universities using our optimization products in their research projects
  – ILOG CPLEX is to Operations Research what SPSS and SAS are to statistics
CPLEX Across the World

1194 Cities – Excluding ISV deployments
## Options for Planning & Scheduling Solutions

<table>
<thead>
<tr>
<th></th>
<th><strong>PROS</strong></th>
<th><strong>CONS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Spreadsheet based</td>
<td>Quickly getting started&lt;br&gt;Familiar tool</td>
<td>Limited size and complexity&lt;br&gt;Hard to maintain&lt;br&gt;Cumbersome What-if analysis</td>
</tr>
<tr>
<td>applications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-packaged</td>
<td>Out-of-the box functionality&lt;br&gt;Packaged best practices</td>
<td>Difficult to change GUI&lt;br&gt;May not integrate&lt;br&gt;May not capture all costs, constraints, or goals&lt;br&gt;May impose the wrong business process</td>
</tr>
<tr>
<td>Applications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Custom Applications</td>
<td>Tailored to business needs</td>
<td>Difficult for Business managers to participate in dev process&lt;br&gt;Difficult to build GUI&lt;br&gt;Difficult to build data integration&lt;br&gt;Difficult to maintain over time&lt;br&gt;“Obligation” to maintain custom optimization and data model</td>
</tr>
<tr>
<td>Component based</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Custom Applications</td>
<td>Tailored to business needs&lt;br&gt;Easy for Business managers to participate in dev process&lt;br&gt;Easy to build GUI&lt;br&gt;Easy to build data integration&lt;br&gt;Easyly maintain integration of optimization model in application</td>
<td>“Obligation” to maintain custom optimization and data model</td>
</tr>
<tr>
<td>Platform based</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ILOG Optimization Decision Manager (ODM) Enterprise

- A flexible planning platform
  - Highly configurable with low risk and low cost
  - Customizable and extensible for perfect fit
- Planning-centric Functionality
  - Data analysis & Visualization
  - Scenario management & Editing
  - Collaborative planning with Scenario Sharing
  - What-if analysis & Sensitivity analysis
- Powered by Optimization
  - Plan Generation & Checking
How does optimization support decision making?

What-If Analysis

INPUTS
- Demand to be Met
- Resources Available
- Costs, Yields & Recipes
- Operational Constraints & Customer Preferences
- Business Goals

MATHEMATICAL MODEL(S)
Using one or many

OPTIMIZATION ENGINE(S)

SCHEDULE OR PLAN WITH METRICS
- Minimized Costs
- Maximized Yields
- Best Possible Timing of Activities
- Specific Resource Assignments

Collaboration
ILOG ODM Enterprise Architecture

ODM Enterprise IDE

ODM Optimization Server

ODM Studio
(for Planner & Reviewer)

ODM IDE

Data Modeling

Application Configuration

Optimization Modeling

Reporting Integration

Development

Deployment

ODM Scenario Repository

ODB Scenario Repository

Database

(LoB)

(IT)

(OR)
Scenario Management & What-if analysis

- Scenarios represent
  - Plans for specific periods
  - Alternatives (What-if analysis)

- Scenarios contain
  - Data, costs,
  - Rules, goals,
  - Solution set with calculated KPIs

- Scenario editing
  - Includes change to any element
Displays using Simple Tables and Charts
### Pivot Tables and Scenario Comparison

#### Costs and Demand Analysis

**Country**

<table>
<thead>
<tr>
<th>Country</th>
<th>2007Q1</th>
<th>2007Q2</th>
<th>2007Q3</th>
<th>2007Q4</th>
<th>2008Q1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>64</td>
<td>67</td>
<td>64</td>
<td>59</td>
<td>60</td>
</tr>
<tr>
<td>Brazil</td>
<td>46</td>
<td>41</td>
<td>44</td>
<td>39</td>
<td>42</td>
</tr>
<tr>
<td>USA</td>
<td>76</td>
<td>79</td>
<td>77</td>
<td>80</td>
<td>78</td>
</tr>
<tr>
<td>Mexico</td>
<td>110</td>
<td>102</td>
<td>106</td>
<td>108</td>
<td>114</td>
</tr>
</tbody>
</table>

**Products**

<table>
<thead>
<tr>
<th>Product</th>
<th>2007Q1</th>
<th>2007Q2</th>
<th>2007Q3</th>
<th>2007Q4</th>
<th>2008Q1</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR50</td>
<td>90 (110)</td>
<td>95 (115)</td>
<td>100 (120)</td>
<td>105 (125)</td>
<td>110 (130)</td>
</tr>
<tr>
<td>CR500</td>
<td>80</td>
<td>85</td>
<td>90</td>
<td>95</td>
<td>100</td>
</tr>
<tr>
<td>CR5000</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
</tr>
</tbody>
</table>

**Comments**

- **Key column**: Key requirements
- **Revised requirements**: Revised requirements
- **Production schedule**: Production schedule
- **Demand vs. allocation**: Demand vs. allocation
- **Inventory levels**: Inventory levels
- **Excess sales**: Excess sales

**Scenario Status**

- **Result up to date**: Yes
- **Last run outcome**: Success
- **Last run duration**: 0:00:07
- **Result proven optimal**: Yes
From Scenario Comparison to Sensitivity Analysis

**Pair-wise Scenario Comparison**
- Detailed inputs and outputs,
- KPIs.

**Multi-Scenario Comparison**
- Goals,
- KPIs.
Extensible with Custom Views
Formatted Copy & Paste

- Row/Colum headers included
- Works with Microsoft Office
  - Excel, Word, Outlook, etc
Optimizing Business Goals

- Manage conflicting business goals
- Effective trade-offs & goal balancing
- Upper/lower limits, goal weights
- Drill-downs for detailed cost analysis

<table>
<thead>
<tr>
<th>Goal Name</th>
<th>Value</th>
<th>Active</th>
<th>Importance Factor</th>
<th>Constrained</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable Plant Cost</td>
<td>$16,403,600</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inbound Transportation Cost</td>
<td>$7,125,135.21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outbound Transportation Cost</td>
<td>$5,627,748.024</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed Distribution Center Cost</td>
<td>$5,280,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable Distribution Center Cost</td>
<td>$2,677,000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IBM Software Impact 2010 Comes to You
Controlled Relaxations of Constraints

- Automatically relax constraints based on business priority
- Display relaxed constraints in groups and allow trade-offs

<table>
<thead>
<tr>
<th>Relaxed Requirements</th>
<th>Relaxation</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each shift should get its nurse requirements</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Demand for Emergency Room</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between 5 and 7 nurses required on Saturday, January 8, 2005 from 2 to 12</td>
<td>0 nurse(s)</td>
<td>High</td>
</tr>
<tr>
<td>Between 5 and 7 nurses required on Sunday, January 9, 2005 from 2 to 12</td>
<td>2 nurse(s)</td>
<td>High</td>
</tr>
<tr>
<td>Pairing Rules</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Teams</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isabelle and Debbie must work in the same team</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Union and Clinical Care Rules</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Skill Rules</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emergency</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>The Emergency Room department requires at least 1 nurse qualified in Cardiac</td>
<td></td>
<td></td>
</tr>
<tr>
<td>nurse on vacation</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>Vacation of Jane</td>
<td></td>
<td></td>
</tr>
<tr>
<td>on Saturday, January 8, 2005</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Collaborative Planning User View

Who’s doing what?

Susan

Mark

Sam

Demand Adjustments Q3

Scenario Overview

- Workspace
- January
- February
- Race Scenarios
- Supply SKU1234

Demand Pivot

Filter is active. Displaying 5 rows by 2 columns built from

<table>
<thead>
<tr>
<th>Type</th>
<th>Price Level</th>
<th>Maturity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demands</td>
<td>Country</td>
<td>Year</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Jan-07</th>
<th>Feb-07</th>
<th>Mar-07</th>
<th>Apr-07</th>
</tr>
</thead>
<tbody>
<tr>
<td>76</td>
<td>110</td>
<td>85</td>
<td>91</td>
</tr>
<tr>
<td>79</td>
<td>102</td>
<td>92</td>
<td>94</td>
</tr>
<tr>
<td>77</td>
<td>106</td>
<td>90</td>
<td>97</td>
</tr>
<tr>
<td>362</td>
<td>367</td>
<td>370</td>
<td></td>
</tr>
</tbody>
</table>

Scenario Explorer

- Demand Adjustments Q3
- Inputs
- Products
- Market
  - Countries
  - Firm Orders
  - Demands Pivot
  - Demand Chart

IBM Software
Impact 2010
Comes to You
Note: Normally, development, test and production servers are separate.
Optimization Model Development

*OPL Perspective*

- Model your problems using objectives and constraints
- Inspect data/solution
- Connect to databases
- Navigate your model
- Analyze your problem and engine performance
- Manage projects with models, data and parameters
- Browse Solutions
Application Development (Configuration)

ODME Perspective

Configure Charts

ODME Perspective

Preview Charts

Define ODM views:
Tables, Charts, Pivots and Custom

Manage projects
with data, displays and extensions
ILOG LogicTools Suite

**LogicNet Plus XE**
Determine optimal number, location, territories, and size of warehouses, plants, and lines. Determine where products should be made.

**Plant PowerOps**
Planning and detailed finite scheduling for process manufacturing plants.

**Transport PowerOps**
Advanced routing optimization engine for on-going use.

**Transportation Analyst**
Strategic routing for fleet sizing, multi-stops, backhauls, and more.

**Product Flow Optimizer**
Determine best flow considering inventory, transportation, and mode.

**Multi-Site Production Sourcing**

**Supply Chain Applications**

**Strategic Network Design**

**Inventory Optimization**

**Production Planning and Scheduling**

**Inventory Analyst: Strategic**
Determine push/pull locations, buffer locations, postponement, and policy analysis.

**Inventory Analyst: Tactical**
Maintain the correct inventory levels on an on-going basis.

**Impact 2010**
Comes to You
LogicNet Plus and SAP

- Recognized as only SAP partner for Network design
  - LogicNet Plus integration with SAP APO is certified in November 2003
  - SAP software partner since January 2004

- Inventory Analyst™ is Powered by SAP NetWeaver
  - Certified in April 2005
  - "Safety Stock Optimizer 1.0" xApp certified in April 2007

- Joint Marketing:
  - Exhibited as part of the SAP SCM booth at Sapphire 2004, 2005
  - GM presented for LogicTools on Inventory Optimization Panel

- Thought Leadership:
  - Chapter in Claus Heinrich book “RFID and beyond”
  - Article with Claus Heinrich in SCMR “Do IT investments pay off?”

- Complementary Products
  - LogicNet Plus provides SAP users with the ability to determine the optimal structure of the supply chain (number and locations of plants, lines, warehouses, and information on what the territories should be for each)
  - Inventory Analyst provides SAP users with strategic multi-echelon inventory calculations to determine where inventory should be positioned. It is also a nice complement to network design
Product Suite Overview

- Strategic Network Design: Helps companies optimize their physical supply chain
- Multi-Echelon Inventory Optimization: Helps companies optimize their inventory levels throughout their supply chain
Visualize the Supply Chain
Compare Scenarios
Making the Trade-Off Between Service and Cost

Optimal Network For Cost

Savings: $6 million
Service: 40% next day

Optimal Network For Service

Savings: $3 million
Service: 80% next day

Which is Better?
## Direct Shipments to BKK (Orange Lines)

### Transportation Lane

<table>
<thead>
<tr>
<th></th>
<th>Weighted Average Distance (km)</th>
<th>Distance Baseline (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier to Retailer</td>
<td>405</td>
<td>-</td>
</tr>
<tr>
<td>DC to Retailer</td>
<td>379</td>
<td>276</td>
</tr>
</tbody>
</table>

### Cost Description

<table>
<thead>
<tr>
<th>Cost Description</th>
<th>Cost (THB)</th>
<th>Cost Baseline (THB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier to DC Shipping Cost</td>
<td>55,714,803</td>
<td>104,824,510</td>
</tr>
<tr>
<td>Supplier to Retail Store Shipping Cost</td>
<td>65,167,062</td>
<td>-</td>
</tr>
<tr>
<td>DC to Retail Store Shipping Cost</td>
<td>104,341,340</td>
<td>124,195,393</td>
</tr>
<tr>
<td>Warehouse Variable Costs</td>
<td>110,163,990</td>
<td>192,311,915</td>
</tr>
<tr>
<td>Supply Costs</td>
<td>1,333,063,820</td>
<td>1,333,063,820</td>
</tr>
<tr>
<td>Warehouse Fixed Costs</td>
<td>70,000,000</td>
<td>70,000,000</td>
</tr>
<tr>
<td><strong>TOTAL COST</strong></td>
<td><strong>1,738,451,015</strong></td>
<td><strong>1,824,395,638</strong></td>
</tr>
</tbody>
</table>
## Mattress sourced from Cambodia

### Transportation Lane

<table>
<thead>
<tr>
<th>Transportation Lane</th>
<th>Weighted Average Distance (km)</th>
<th>Distance Baseline (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier to Retailer</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>DC to Retailer</td>
<td>276</td>
<td>276</td>
</tr>
</tbody>
</table>

### Cost Description

<table>
<thead>
<tr>
<th>Cost Description</th>
<th>Cost (THB)</th>
<th>Cost Baseline (THB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier to DC Shipping Cost</td>
<td>105,822,375</td>
<td>104,824,510</td>
</tr>
<tr>
<td>Supplier to Retail Store Shipping Cost</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>DC to Retail Store Shipping Cost</td>
<td>124,195,393</td>
<td>124,195,393</td>
</tr>
<tr>
<td>Warehouse Variable Costs</td>
<td>192,311,915</td>
<td>192,311,915</td>
</tr>
<tr>
<td>Supply Costs</td>
<td>1,246,013,320</td>
<td>1,333,063,820</td>
</tr>
<tr>
<td>Warehouse Fixed Costs</td>
<td>70,000,000</td>
<td>70,000,000</td>
</tr>
<tr>
<td><strong>TOTAL COST</strong></td>
<td><strong>1,738,343,002</strong></td>
<td><strong>1,824,395,638</strong></td>
</tr>
</tbody>
</table>
## Overall Comparison

<table>
<thead>
<tr>
<th>Cost</th>
<th>Baseline</th>
<th>Direct Shipment to BKK</th>
<th>Second DC in South</th>
<th>Mattress From Cambodia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sourcing Costs</td>
<td>1,333,063,820</td>
<td>1,333,063,820</td>
<td>1,333,063,820</td>
<td>1,246,013,320</td>
</tr>
<tr>
<td>Transportation Cost</td>
<td>229,019,903</td>
<td>225,223,205</td>
<td>214,796,834</td>
<td>230,017,768</td>
</tr>
<tr>
<td>Warehouse Cost</td>
<td>262,311,915</td>
<td>180,163,990</td>
<td>245,914,872</td>
<td>262,311,915</td>
</tr>
<tr>
<td><strong>TOTAL COST</strong></td>
<td><strong>1,824,395,638</strong></td>
<td><strong>1,738,451,015</strong></td>
<td><strong>1,793,775,526</strong></td>
<td><strong>1,738,343,002</strong></td>
</tr>
<tr>
<td>Percent Reduction</td>
<td></td>
<td>4.94%</td>
<td>1.71%</td>
<td>4.95%</td>
</tr>
</tbody>
</table>
Example of Cost Breakdown

11% savings!

Cost Category

- **Total**: $69.5 million ($61.8 million Optimal 6)
- **Inbound**: $1.5 million ($3.9 million Optimal 6)
- **Outbound**: $27.7 million ($15.0 million Optimal 6)
- **Production**: $19.2 million ($17.5 million Optimal 6)
- **Fixed Cost**: $6.5 million ($10.4 million Optimal 6)
- **Var/Inv**: $14.7 million ($15.0 million Optimal 6)
Current Inventory Levels vs. Optimized Inventory Levels

### Historical Avg Inv vs. Optimized Target Inv ($)

<table>
<thead>
<tr>
<th>Inventory $</th>
<th>Historical Avg Inv $</th>
<th>Optimized Target Inv $</th>
</tr>
</thead>
<tbody>
<tr>
<td>$8M</td>
<td>$5,762,023</td>
<td>$7,404,836</td>
</tr>
</tbody>
</table>

### Optimized Target Inv - Historic Avg Inv for each SKU

<table>
<thead>
<tr>
<th>SKU</th>
<th>Optimized Target Inv - Historic Avg Inv</th>
</tr>
</thead>
<tbody>
<tr>
<td>CG40CD-BA</td>
<td>$300K</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>$200K</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>$100K</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>$0K</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>$-100K</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>$-200K</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>$-300K</td>
</tr>
</tbody>
</table>

### Safety Stock vs. Cycle Stock ($)

<table>
<thead>
<tr>
<th>Inventory $</th>
<th>Sum of Safety Stock $</th>
<th>Sum of Cycle Stock $</th>
</tr>
</thead>
<tbody>
<tr>
<td>$8M</td>
<td>$7,123,089</td>
<td>$281,747</td>
</tr>
</tbody>
</table>

### Months Supply

<table>
<thead>
<tr>
<th>SKU</th>
<th>Months Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>CG40CD-BA</td>
<td>7.2</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>5.8</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>3.6</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>2.5</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>2.4</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>2.4</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>2.2</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>1.9</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>1.9</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>1.6</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>1.6</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>1.6</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>1.5</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>1.4</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>1.3</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>1.3</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>1.2</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>1.1</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>1.0</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>0.9</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>0.9</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>0.9</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>0.6</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>0.2</td>
</tr>
<tr>
<td>CG40CD-BA</td>
<td>0.1</td>
</tr>
</tbody>
</table>
## Detailed Output Showing Safety Stock by Product

<table>
<thead>
<tr>
<th>Warehouse</th>
<th>Product</th>
<th>Planning Period</th>
<th>Demand</th>
<th>Forecast Error</th>
<th>Cycle Service Level</th>
<th>Fill Rate (%)</th>
<th>Incoming Service Time</th>
<th>Base Stock Level</th>
<th>Reorder Point</th>
<th>Safety Stock Level</th>
<th>Safety Stock Holding Cost</th>
<th>Cycle Stock Level</th>
<th>Cycle Stock Holding Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>APRDC</td>
<td>A111</td>
<td>Avg Vm</td>
<td>695</td>
<td>407.29</td>
<td>97.5</td>
<td>99.5</td>
<td>T</td>
<td>3,522.93</td>
<td>1,438.93</td>
<td>2,870.09</td>
<td>886</td>
<td>1,392.11</td>
<td></td>
</tr>
<tr>
<td>APRDC</td>
<td>A112</td>
<td>Avg Vm</td>
<td>73.75</td>
<td>30.99</td>
<td>90.43</td>
<td>99.5</td>
<td>T</td>
<td>344.12</td>
<td>104.67</td>
<td>239.73</td>
<td>73.75</td>
<td>1,539.51</td>
<td></td>
</tr>
<tr>
<td>APRDC</td>
<td>A113</td>
<td>Avg Vm</td>
<td>167</td>
<td>76.52</td>
<td>96.64</td>
<td>99.5</td>
<td>T</td>
<td>623.35</td>
<td>262.35</td>
<td>524.75</td>
<td>187</td>
<td>374.03</td>
<td></td>
</tr>
<tr>
<td>APRDC</td>
<td>A114</td>
<td>Avg Vm</td>
<td>193.5</td>
<td>84.03</td>
<td>96.79</td>
<td>99.5</td>
<td>T</td>
<td>883.86</td>
<td>268.36</td>
<td>575.57</td>
<td>196.5</td>
<td>397.03</td>
<td></td>
</tr>
<tr>
<td>APRDC</td>
<td>A115</td>
<td>Avg Vm</td>
<td>345.47</td>
<td>96.64</td>
<td>99.5</td>
<td>T</td>
<td>3,788.04</td>
<td>1,822.78</td>
<td>2,359.75</td>
<td>861.75</td>
<td>1,723.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>APRDC</td>
<td>A116</td>
<td>Avg Vm</td>
<td>227.75</td>
<td>79.26</td>
<td>96.25</td>
<td>99.5</td>
<td>T</td>
<td>953.72</td>
<td>270.47</td>
<td>549.93</td>
<td>227.76</td>
<td>465.54</td>
<td></td>
</tr>
<tr>
<td>APRDC</td>
<td>A117</td>
<td>Avg Vm</td>
<td>3,267.76</td>
<td>0.66</td>
<td>09.66</td>
<td>T</td>
<td>10,217.60</td>
<td>3,114.34</td>
<td>6,293.17</td>
<td>2,367.76</td>
<td>4,716.96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>APRDC</td>
<td>A118</td>
<td>Avg Vm</td>
<td>645.75</td>
<td>252.48</td>
<td>96.56</td>
<td>99.5</td>
<td>T</td>
<td>2,800.63</td>
<td>863.38</td>
<td>1,726.90</td>
<td>645.75</td>
<td>1,559.60</td>
<td></td>
</tr>
<tr>
<td>APRDC</td>
<td>A119</td>
<td>Avg Vm</td>
<td>549.5</td>
<td>133.46</td>
<td>96.25</td>
<td>99.5</td>
<td>T</td>
<td>2,306.24</td>
<td>659.74</td>
<td>1,319.53</td>
<td>548.5</td>
<td>1,099.06</td>
<td></td>
</tr>
<tr>
<td>APRDC</td>
<td>B120</td>
<td>Avg Vm</td>
<td>201.26</td>
<td>103.7</td>
<td>96.33</td>
<td>99.5</td>
<td>T</td>
<td>1,227.76</td>
<td>364</td>
<td>708.05</td>
<td>201.26</td>
<td>682.64</td>
<td></td>
</tr>
<tr>
<td>APRDC</td>
<td>B121</td>
<td>Avg Vm</td>
<td>344</td>
<td>113.25</td>
<td>96.08</td>
<td>99.5</td>
<td>T</td>
<td>1,418.59</td>
<td>386.59</td>
<td>773.24</td>
<td>344</td>
<td>688.05</td>
<td></td>
</tr>
<tr>
<td>APRDC</td>
<td>B122</td>
<td>Avg Vm</td>
<td>115,043.75</td>
<td>4,082.4</td>
<td>95.91</td>
<td>99.5</td>
<td>T</td>
<td>84,253.01</td>
<td>11,005.76</td>
<td>35,215.05</td>
<td>11,048.75</td>
<td>31,059.59</td>
<td></td>
</tr>
<tr>
<td>APRDC</td>
<td>B123</td>
<td>Avg Vm</td>
<td>336</td>
<td>110.06</td>
<td>96.06</td>
<td>99.5</td>
<td>T</td>
<td>1,304.60</td>
<td>376.06</td>
<td>752.22</td>
<td>336</td>
<td>672.05</td>
<td></td>
</tr>
<tr>
<td>APRDC</td>
<td>B124</td>
<td>Avg Vm</td>
<td>1,697.5</td>
<td>546.84</td>
<td>96.99</td>
<td>99.5</td>
<td>T</td>
<td>6,958.78</td>
<td>1,866.26</td>
<td>3,732.84</td>
<td>1,697.5</td>
<td>3,396.26</td>
<td></td>
</tr>
<tr>
<td>APRDC</td>
<td>B125</td>
<td>Avg Vm</td>
<td>2,460.75</td>
<td>730.91</td>
<td>95.82</td>
<td>99.5</td>
<td>T</td>
<td>9,807.95</td>
<td>2,501.3</td>
<td>5,002.98</td>
<td>2,466.75</td>
<td>4,337.88</td>
<td></td>
</tr>
<tr>
<td>APRDC</td>
<td>B126</td>
<td>Avg Vm</td>
<td>419</td>
<td>104.49</td>
<td>96.00</td>
<td>99.5</td>
<td>T</td>
<td>1,651.18</td>
<td>634.19</td>
<td>1,205.49</td>
<td>419</td>
<td>630.00</td>
<td></td>
</tr>
<tr>
<td>APRDC</td>
<td>B127</td>
<td>Avg Vm</td>
<td>207.5</td>
<td>61.16</td>
<td>95.02</td>
<td>99.5</td>
<td>T</td>
<td>632.18</td>
<td>208.08</td>
<td>419.42</td>
<td>207.5</td>
<td>415.03</td>
<td></td>
</tr>
<tr>
<td>APRDC</td>
<td>B128</td>
<td>Avg Vm</td>
<td>322</td>
<td>83.59</td>
<td>95.45</td>
<td>99.5</td>
<td>T</td>
<td>1,255.66</td>
<td>260.66</td>
<td>573.06</td>
<td>322</td>
<td>644.05</td>
<td></td>
</tr>
<tr>
<td>APRDC</td>
<td>B129</td>
<td>Avg Vm</td>
<td>552.76</td>
<td>216.27</td>
<td>96.56</td>
<td>99.5</td>
<td>T</td>
<td>2,400.41</td>
<td>730.16</td>
<td>1,475.44</td>
<td>556.75</td>
<td>1,113.60</td>
<td></td>
</tr>
<tr>
<td>APRDC</td>
<td>B130</td>
<td>Avg Vm</td>
<td>27.5</td>
<td>11.71</td>
<td>96.79</td>
<td>99.5</td>
<td>T</td>
<td>122.73</td>
<td>40.23</td>
<td>90.47</td>
<td>27.5</td>
<td>55.00</td>
<td></td>
</tr>
<tr>
<td>APRDC</td>
<td>B131</td>
<td>Avg Vm</td>
<td>174.75</td>
<td>67.98</td>
<td>96.56</td>
<td>99.5</td>
<td>T</td>
<td>759.34</td>
<td>232.29</td>
<td>454.61</td>
<td>174.75</td>
<td>349.53</td>
<td></td>
</tr>
<tr>
<td>APRDC</td>
<td>B132</td>
<td>Avg Vm</td>
<td>103</td>
<td>34.62</td>
<td>96.17</td>
<td>99.5</td>
<td>T</td>
<td>427.21</td>
<td>118.21</td>
<td>236.44</td>
<td>103</td>
<td>308.02</td>
<td></td>
</tr>
<tr>
<td>APRDC</td>
<td>B133</td>
<td>Avg Vm</td>
<td>15.25</td>
<td>5.97</td>
<td>96.41</td>
<td>99.5</td>
<td>T</td>
<td>68.15</td>
<td>20.4</td>
<td>40.80</td>
<td>16.25</td>
<td>32.50</td>
<td></td>
</tr>
<tr>
<td>APRDC</td>
<td>B134</td>
<td>Avg Vm</td>
<td>27</td>
<td>9.42</td>
<td>90.25</td>
<td>99.5</td>
<td>T</td>
<td>113.13</td>
<td>32.13</td>
<td>64.23</td>
<td>27</td>
<td>54.00</td>
<td></td>
</tr>
<tr>
<td>APRDC</td>
<td>B135</td>
<td>Juma Vm</td>
<td>31</td>
<td>11.87</td>
<td>96.44</td>
<td>99.5</td>
<td>T</td>
<td>123.82</td>
<td>38.82</td>
<td>79.68</td>
<td>31</td>
<td>60.00</td>
<td></td>
</tr>
</tbody>
</table>
Product Suite: ILOG Transport Analyst
From Network (LNP) to Transport Analysts (TA)

LogicNet Plus XE

Sacramento DC

Transportation Analyst

Annual Snapshot
Total Weight Delivered = 19MM lbs
  - Avg. Week 375K lbs
Total Transportation Cost = $1.5MM
  - Avg Week $28.6K per week

Typical Week
Total Weight Delivered = 380K lbs
Total Transportation Cost = $29.4K
  - Within 3% of LNP Weekly Avg
Shipment Routing Evaluation

Each Customer is promised delivery on a specific day (5 Time Windows)

Each customer is promised delivery during a portion of the week (2 Time Windows)

Deliveries can be made at any point throughout the week (1 Time Window)

<table>
<thead>
<tr>
<th>Value</th>
<th>Value</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Vehicles</td>
<td>21</td>
<td>Number of Vehicles</td>
</tr>
<tr>
<td>Total Distance</td>
<td>34,386</td>
<td>Total Distance</td>
</tr>
<tr>
<td>Deadhead Distance</td>
<td>11,621</td>
<td>Deadhead Distance</td>
</tr>
<tr>
<td>TOTAL COST</td>
<td>$88,301</td>
<td>TOTAL COST</td>
</tr>
</tbody>
</table>

37% Savings

+ 30% Savings

TOTAL COST $88,301

TOTAL COST $55,877

TOTAL COST $29,369

ILOG, All rights reserved 44
ILOG Plant PowerOps

Integrated planning and scheduling solution for the process industry

- FMCG
  - Fresh dairy
  - Tobacco
  - Chocolate, Candies
  - Biscuits
  - Baby food
  - Beer, Soda

- Pharmaceutical
  - Biotech
  - Pharmaceutical

- Chemicals
  - Consumer chemicals
  - Cosmetics
  - Industrial chemicals

- Electronics
  - Media/Semiconductor

- High demand variability
- Complex manufacturing process
- Focus on performance management and cost control
- Product mix changes, new product introduction, phase out
- Complex product quality issues

- Models key manufacturing constraints
- Designed as a decision support system
- Strength on optimization and performance analysis
- Integration in IT landscape
ILOG Plant PowerOps Overview

Interactive planning

Production Planner

Planning Scenarios

Optimize:
- Order fulfillment
- Cycle time
- Production cost
- Inventory
- Utilization

Interactive Gantt Chart

- Production schedules
- Pegging arcs
- Machine lineups
- Resource loads
- Safety stock
- Tank levels

Interactive Graphical Planning Board

- Daily or weekly plans
- Calendar view
- Plan validation
- Exceptions
- Alerts
- Reports

Model

Manufacturing Data

Production orders
- Due dates
- Dependencies
- Resources
- Calendars
- Modes
- Setup models
- Recipes
- Shipment costs

Business Rules

Goals
- Constraints
- Parameters
- Filters

Integrated Planning & Scheduling

Detailed Scheduling

ILOG Plant PowerOps

Production Planning

Integration

Enterprise Resource Planning

Supply Chain Management

Manufacturing Execution System

Advanced Process Control
Master Data Maintained in ERP/SCM System

ILOG Planning & Scheduling System

Planning & Scheduling Model

Mapping

Websphere SAP Data Adapter

ERP/SCM Model Instantiation

Load/Refresh/Commit

ERP / SCM

Master Data

Transactional Data

ILOG Solution

Impact 2010 Comes to You
Set the optimization goals and parameters
Integrated Planning and Scheduling

Reach operational efficiency while respecting min and max days of supply

Analyze demand variation, inventory, min and max days of supply
Managing Plant Floor Constraints

- Continuous process
- Multi-purpose storage tank
- Max duration on storage tank
- Cleaning policies
The stock summary gives an overview of the production.

The stock coverage view details the situation of the inventory for each specific product.
Add a new production order

Violation Panel
- Show violations of tank capacity and batch mixing

Tank Level Display
- Monitor tank levels and uncover problems, such as insufficient intermediate products
Fixed Production Orders have a “brick” pattern

Ordinary changeover with no major cleaning (installing fruit container, rinsing)

- These setups have no pattern

Enforce maximum 36 hours between two cleanings

Changeover with Cleaning In Place triggered by allergen transition

- These setups textured
Optimized inventory to remain in Coverage Corridor at the end of each day.
Impact

• Part of the additional demand is left unsatisfied because of missing capacity

KPI Comparison Panel

• Provides an easy way to compare scenario solutions
• A plug-in mechanism allows to define custom KPIs.
Scenario Creation and Comparison

What-if analysis with precise KPIs

- Create and manage scenarios
- Copy scenarios
- Test different planning strategies
- Define and apply business policies
- Define and compare custom KPIs
- Compare Gantt charts and solutions side by side
Inside the plant: Network Structure

Capability to configure a model to reflect the current manufacturing network structure at a macro level with only bottleneck resources identified. The gross capacity on the bottleneck resource should be modeled.

Define the resources, resource groups and connections using PPO’s plant layout.
Outside the plant: Network Structure

Capability to configure a model to reflect the current manufacturing network structure at a macro level with only bottleneck resources identified. The gross capacity on the bottleneck resource should be modeled.
Multiple Optimisation Profiles

Generate the supply plans based on forecast, sales orders and inventory requirements.

The different “optimization profiles” can be defined. Planners can choose an existing optimization profile or creating a new one.

Each optimization profile defines the goals of the schedule by setting the relative importance of different objectives.
Editing Planned Production with Automatic Configuration

Multi-step Recipes:
Automatic configuration of the possible modes function of previous choices
Re-planning: Reducing System Nervousness

Enforce Fulfillment in Next Production Run

- Enforce that next run of planning engine fulfill at least the same percentage of a demand as in the current planning solution

- If the delivery window is larger than the time bucket then the planned delivery may be occur later
Reducing Re-planning nervousness

- **Fix planned productions in current planning solution**

<table>
<thead>
<tr>
<th>Demand</th>
<th>Procurements</th>
<th>Production Orders</th>
<th>Arcs</th>
<th>Scheduled Activities</th>
<th>Planned Productions</th>
<th>Planned Deliveries</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>recipe</td>
<td>bucket</td>
<td>quantity</td>
<td>resp.</td>
<td>firm</td>
<td>start min</td>
</tr>
<tr>
<td>bio-strawberry 1</td>
<td>bio-strawberry</td>
<td>8-Dec</td>
<td>206.00</td>
<td></td>
<td></td>
<td>8 Dec 2006 00:00:00</td>
</tr>
<tr>
<td>bio-strawberry 6</td>
<td>bio-strawberry</td>
<td>13-Dec</td>
<td>60.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bio-prune 0</td>
<td>bio-prune</td>
<td>13-Dec</td>
<td>102.00</td>
<td></td>
<td></td>
<td>7 Dec 2006 00:00:00</td>
</tr>
<tr>
<td>bio-prune 1</td>
<td>bio-prune</td>
<td>8-Dec</td>
<td>174.00</td>
<td></td>
<td></td>
<td>8 Dec 2006 00:00:00</td>
</tr>
<tr>
<td>bio-prune 5</td>
<td>bio-prune</td>
<td>13-Dec</td>
<td>71.00</td>
<td></td>
<td></td>
<td>13 Dec 2006 00:00:00</td>
</tr>
</tbody>
</table>

- **Fix planned deliveries in current planning solution**

<table>
<thead>
<tr>
<th>Demand</th>
<th>Procurements</th>
<th>Production Orders</th>
<th>Arcs</th>
<th>Scheduled Activities</th>
<th>Planned Productions</th>
<th>Planned Deliveries</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>recipe</td>
<td>bucket</td>
<td>quantity</td>
<td>disp...</td>
<td>firm</td>
<td>start min</td>
</tr>
<tr>
<td>Kiwi Cereals 1...</td>
<td>Kiwi Cereals 12/07</td>
<td>7-Dec</td>
<td>99.00</td>
<td></td>
<td></td>
<td>7 Dec 2006 00:00:00</td>
</tr>
<tr>
<td>Kiwi Cereals 1...</td>
<td>Kiwi Cereals 12/00</td>
<td>8-Dec</td>
<td>141.00</td>
<td></td>
<td></td>
<td>8 Dec 2006 00:00:00</td>
</tr>
<tr>
<td>Kiwi Cereals 1...</td>
<td>Kiwi Cereals 12/09</td>
<td>9-Dec</td>
<td>84.00</td>
<td></td>
<td></td>
<td>9 Dec 2006 00:00:00</td>
</tr>
<tr>
<td>Kiwi Cereals 1...</td>
<td>Kiwi Cereals 12/10</td>
<td>12-Dec</td>
<td>122.00</td>
<td></td>
<td></td>
<td>10 Dec 2006 00:00:00</td>
</tr>
<tr>
<td>Kiwi Cereals 1...</td>
<td>Kiwi Cereals 12/12</td>
<td>12-Dec</td>
<td>116.00</td>
<td></td>
<td></td>
<td>12 Dec 2006 00:00:00</td>
</tr>
</tbody>
</table>
## KPI Scenario Comparisons

### New Scenario Revision

<table>
<thead>
<tr>
<th>KPI</th>
<th>Initial</th>
<th>Standard</th>
<th>Supply/Chain</th>
<th>Factory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventory Excess (€)</td>
<td>1136.65</td>
<td>513.81</td>
<td>453.78</td>
<td>579.74</td>
</tr>
<tr>
<td>Inventory Deficit (€)</td>
<td>22,021.54</td>
<td>17,768.21</td>
<td>18,049.80</td>
<td>19,003.19</td>
</tr>
<tr>
<td>Daily Inventory Excess Incidents</td>
<td>60.00</td>
<td>36.00</td>
<td>32.00</td>
<td>41.00</td>
</tr>
<tr>
<td>Daily Inventory Deficit Incidents</td>
<td>195.00</td>
<td>170.00</td>
<td>170.00</td>
<td>177.00</td>
</tr>
<tr>
<td>Operational Efficiency (%)</td>
<td>62.92</td>
<td>63.10</td>
<td>63.20</td>
<td>63.72</td>
</tr>
<tr>
<td>Operational Utilization (%)</td>
<td>78.91</td>
<td>66.48</td>
<td>68.75</td>
<td>69.32</td>
</tr>
<tr>
<td>Average Cycle Time (h)</td>
<td>50.71</td>
<td>45.55</td>
<td>41.10</td>
<td>47.31</td>
</tr>
<tr>
<td>Total Cleaning Time (h)</td>
<td>134.65</td>
<td>178.65</td>
<td>192.92</td>
<td>164.05</td>
</tr>
<tr>
<td>Total Setup Time (h)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Average Competence (%)</td>
<td>98.87</td>
<td>98.64</td>
<td>94.93</td>
<td>97.48</td>
</tr>
<tr>
<td>White Mass Waste Cost ($)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Fruit Change Waste Cost ($)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Packaging Change Waste Cost ($)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Max Direct Labor (people)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Manpower (man-hours)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

### Standard Baseline

### Overall Supply Chain Cost

### Factory Throughput
Available-To-Promise

- Without changing the planning solution we can promise 187 pallets Dec 7th
Capable-To-Promise

- Could we produce more bio-strawberry on December 7th with a different trade-off?

Prioritize the customers using non-delivery costs and re-optimize

1000 achievable?
We can promise 75% of the 1000 required.

We can promise 751.

We let 249 unsatisfied.
Profitable-To-Promise

- Should we meet this customer’s requirements?
- How profitable is this order?
Asset utilization

- Detailed workload table including total changeover time, total productive time etc. by resource or by resource family
PPO provides Fully Configurable Reporting Capabilities

Pre-defined measures

Pre-defined reports
Integrated Planning and Scheduling

Reach operational efficiency while respecting min and max days of supply

Analyze demand variation, inventory, min and max days of supply
Inventory alerts in PPO

Inventory **excess** with respect to **max** days of supply

Inventory **deficit** with respect to **min** days of supply
Stock Summary View

Summary of inventory levels for intermediates and finished goods expressed in quantity and days of supply.
Fresh dairy products Yogurt Production Process

- Semi-finished product

**Milk**
- Cow
- Soy

**Pasteurizers**
- Setup times

**Fermenters**
- Capacity
- Batch size

**Storage Tanks**
- Connectivity
- Compatibility

**Planning Objectives**
- Plan how much of each product to produce per day
- Schedule production at minute granularity
- Minimize setups
- Minimize out-of-stock risks
- Minimize waste
- Push production

**Finished Product**

**Filling Lines**
- Multi-purpose
- Setup times
- Cleaning in place
Extending PP/DS with Plant PowerOps

Danone Factory Layout

- **Powder milk**
- **Cream**
- **Low-fat milk**
- **Sugar**

**Yogurt preparation**

- **Fermentation**
- **Storage of final products**
- **Coolers**
- **Packing lines**
PASTO

Cow Milk

Soy Milk

2 kind of raw materials: cow milk and soy milk, a setup time is incurred to clean the pasto after soy milk

Fermenter 7, Tank 7, Line 7 down

Intermediates: different White Masses obtained from fermentation of milk in batches and stored in cold storage tanks

Connectivity to be managed between tanks and lines

On conditioning lines:
• Setup times when product switching (labeling, fruit container plugging etc.)
• Cleaning In Place triggered on:
  • transition from product with allergens
  • elapsed time since previous CIP

Final products: fruit adding and packaging
Not all products can be made on all lines
Pharmaceutical Industry

PREPARATION OF THE
ACTIVE INGREDIENT

Chemical Substances
Synthesis

Micro-organic cultures
Fermentation & purification

Vegetable or animal tissues
Extraction

Pharmacologically active ingredient

Proportioning

Mixing
Capsules, Granules, Tablets, Pills, ...

Direct use

PREPARATION OF THE
PHARMACEUTICAL
PRODUCT

Packaging

PACKAGING
Example

Micro-organic cultures → Cell culture and harvest → Purification → Bulk, fill, freeze, dry

Bioreactors and harvest → Upstream purification → Downstream purification

CIP Skids → Media preparation and hold → Buffer preparation and hold → Buffer preparation and hold → CIP Skids

9/3/2010 ILOG, All rights reserved
Example
Conclusion: Benefits

- Reduce waste, work-in-process inventory and cycle time
- Increase throughput via improved resource utilization
- Generate realistic schedules by taking into accounts true manufacturing constraints
- Improve the synchronization between intermediate products and finished goods
- Align manufacturing execution with demand sensing
- Reduce planning and scheduling cycle time
- Improve production smoothing by generating plans with stable production frequency and low production variability
- Quickly align manufacturing strategies to changing market conditions
Thank You