



# A proper overview of production generates remarkable results

**Novozymes is a global market leader in the field of biotech. They specialize in the production of enzymes and micro-organisms in more than 700 different products. In 2005, Novozymes had a turnover of 6.3 billion DKK.**

The company has 4000 employees, of which approximately 50% are employed in Denmark. Novozymes' division in Kalundborg is the world's largest and most advanced enzyme production facility, and it has 600 people employed in the production of enzymes.

#### **ENZYMES EVERYWHERE**

Enzymes for industrial utilization are found in e.g. detergents, animal feed, the production processes of bread, wine, beer and juice, and also

*"The primary and most remarkable achievement has been to improve lead time."*

in the treatment processes of textiles and leather. Enzymes replace traditional chemicals or additives, and make possible a reduction of water and energy consumption in many production processes. Enzymes are found inherently in all living organisms – in both plants and animals as well as in human beings.

#### **THE PRODUCTION PROCESS**

A fermentation process is a biologi-

cal process that is created by micro-organisms such as yeast cells or bacteria. An example of such a process is the process through which yeast cells transform sugar into alcohol. Fermentation is the technical term for a production process based on cultivation of micro-organisms for bio-chemical products. After fermentation, the material undergoes a very complicated cleansing and purifying process that is divided into several steps. The purification processes are carried out at another location, in a separate purification facility. The material is liquid and undergoes a process involving between 5 and 12 steps. It takes up to 170 hours to complete the process. The production process varies considerably. The material consists of living yeast cells, and consequently not two batches will be identical – nor will they react in the same way.



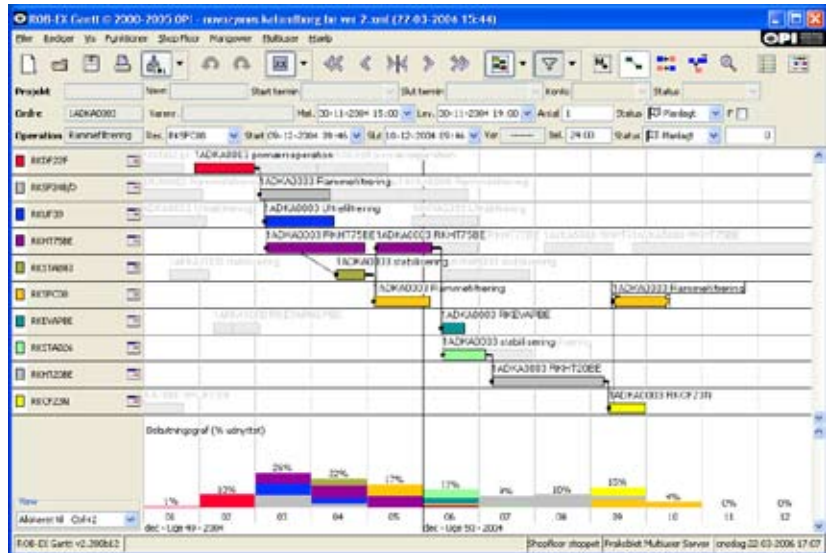
### AMBITIONS FOR BETTER PLANNING

In 2004 Novozymes decided to improve the planning procedures of the purification processes. In general the objective was to carry out the planning assignments locally and to improve the predictability of the purification processes. The means to achieving these objectives included improving the degree of detailed planning. Prior to this project, it was only possible to plan the first step of the proces, and consequently, it was difficult to identify and optimize the bottleneck situations that occur during the proces, in advance. The aim was to be able to plan all processes, including intermediate storage in containment facilities (tanks). A final requirement of the project was that the chosen solution could be implemented very quickly.

### THE SOLUTION

Novozymes chose a solution based on ROB-EX Gantt because it provided:

- Both graphic presentation and editing of the Gantt chart
- Definition of resources, including capacity, and the possibility of flexible definitions allowing one or more physical installations to be viewed as one unit/resource in the plan



- Linking of steps in the proces
  - Incorporation of time consumption for set-up, readjustments and transportation as well as overlap of operations
  - Generation of alternative production routes
  - Reporting of start/stop from the shop floor to the plan, with immediate and visual notification of consequences of delays in relation to the individual order as well as the overall production plan
  - Rescheduling based on the given circumstances of a new situation
  - Sorting of bottlenecks in the plan
- The production planner in the factory uses this solution to make a

detailed plan for each order, locally, in a production facility that employs approximately 40 resources. At any given time the current plan is distributed electronically via a viewer to operators in the control centres.

The screen image above shows the production sequence of a given order as well as the work load on all resources. Other orders have been filtered out in the above example, but by displaying all orders the planner is able to see the leadtime of all orders, possible delays in delivery and the overall work load of one, several or all resources. This provides an overview that makes it possible to see possible bottleneck situations

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in advance. In a bottleneck situation the solution includes tools for optimizing the bottleneck and for synchronizing all other resources with the bottleneck resource.

The screen image below is taken from the local work station of the operator of one of the resources, and it shows the Shop Floor operations list. The work station has a direct uplink to the plan so that all changes to the plan and reportings from the shop floor are registered and shown immediately.

#### INTEGRATION WITH SAP

Novozymes employs SAP “wall-

to-wall”. Data for detailed planning is generated in SAP and transmitted to the planning system. The transmission of data includes order specifications such as batch number, item id, amounts and planned start/stop as well as resources and proces recipes. SAP and ROB-EX Gantt combine in securing hierarchical planning: SAP performs MRP breakdown to secure the necessary components, and carries out master planning. ROB-EX Gantt is employed for the detailed planning of the individual factories/facilities. The factories/facilities operate independently at their respective levels, while continuously subjected

to the principal coordination that is carried out in the SAP system.

#### REMARKABLE ACHIEVEMENTS

The primary and most remarkable achievement has been to improve leadtime. Despite the unpredictability that is an integral element of biological processes, the result has been a substantial improvement concerning the variations in leadtime. This has resulted in greater precision regarding due date performance to internal customers, and it has contributed to reducing the weighted average leadtime with approximately 30%. Secondary improvements that have been achieved through optimising the leadtime have included reduction of WIP (Work In Process) and it has freed capacity on existing equipment. The overall result is that the implementation of new planning processes has affected productivity in a very positive way.

The overview of the plan enables operators to see how a delay in one part of the proces affects the rest of the production proces, and to see how other activities in the plan may be influenced by this. Operators are also able to view alternative solutions for making adjustments to the

Ordre	Operation	Kunde	Vare	Start	Slut	Status	Antal
1ADKA0003	RKHT75BE			03-12-2004 04:46	04-12-2004 22:46	Planlagt	1
1ADKA0003	RKHT75BE			05-12-2004 03:46	06-12-2004 03:46	Planlagt	1
1AYKA5000	RKHT75BE			06-12-2004 03:46	06-12-2004 23:46	Planlagt	1
1AYKA5000	RKHT75BE			08-12-2004 03:46	09-12-2004 09:46	Planlagt	1
1AYKA5000	RKHT75BE			09-12-2004 17:46	16-12-2004 17:46	Planlagt	1

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plan. The decision-making process has accelerated, and it is based on more qualified information. Operators and employees are very pleased with the visual overview and the clear layout of the complex production process. A further element of the success of the project is that the solution is easy to use without being too simple. This is illustrated in the precision with which overview of the plan is ensured, e.g. by an ingenious use of colour and by the user-friendly methods and applications that have been the basis for creating the solution.

#### **EXPERIENCES FROM THE IMPLEMENTATION PROCESS**

The implementation period was short. It took approximately 14 weeks to integrate the solution and to get started. The most time-consuming exercise (10-12 weeks) was the preparation of data in SAP (development and structuring of Master Recipes). A spin-off from this assignment has been that data for planning in SAP is now more accurate.

Based on the experience that has been gained from the successful project for the purification facil-

ity in Kalundborg, Novozymes has chosen the same solution for another facility in Kalundborg, and for their factory on Fuglebakken in Copenhagen. Currently, studies are carried out to determine the extent to which it will be a value-adding exercise for Novozymes to implement the solution in all factories and facilities, both nationally and internationally.

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## SUMMARY

### COMPANY

Novozymes A/S, Denmark

### SOLUTIONS

Production Management

- Production planning

### PRODUCTS

- ROB-EX Gantt Planner
- ROB-EX Gantt Shop Floor
- ROB-EX Gantt ERP Integration

### BENEFITS

- Reduced work in progress
- Reduced lead time
- Rapid implementation
- Visual overview and editing of schedule
- All planning data provided direct from ERP
- Quick rescheduling when process variation occurs
- Local detailed scheduling
- Improved predictability
- Easy identification of possible bottlenecks
- Planning includes intermediate storage capacity
- Simulation of consequences