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**JUNE 2009** 

# **Advanced Production Planning**



TŘINECKÉ ŽELEZÁRNY



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With what expectations was the project started - the view of Member of the Board and Project Sponsor.

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Improved production effectiveness and unprecedented performance.

> 97,5 % to the quoted delivery day

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# **APS and Corporate Strategy**

# Unbeatable delivery reliability, promptness and flexibility of supply to customers, thanks to the advanced planning project.

The chairman of the Board of Directors and Managing Director of Třinecké železárny, Mr. Jiří Cienciala, presents his company, project of advanced planning of metallurgical production and its importance for development of corporate strategy.

real challenges, including competitive pressures, globalization, with extraordinary complexity. Our new planning process supported

consolidation, increasing customer expectations in terms of term reliability, flexibility and delivery performance, limited capacities and resources, pressure from the shareholders for increased value of the company, and others.

In order to handle these demanding requirements TŽ launched a series of projects of strategic changes in all the important areas of company life. The changes apply to partnerships, technologies, people and management. The most important project in the area of management has been the recent implementation of an advanced planning system (APS). Its goal was not only to achieve high operational efficiency (economy of production, minimization of work in progress, precise scheduling of material needs, fast stock rotation, optimum use of capacities, high throughput, short production transit times), but also high delivery competence (high term

reliability of supplies, fast reaction to demand, shortest possible lead times, and information service).



Jiří Cienciala Chairman of the Board and CEO. TŽ

In recent years Třinecké železárny successfully coped with In the course of implementation of the project we managed to cope

by the APS system efficiently considers all the substantial limitations with which we work in the production process since entrance of the order to steel plant till dispatch. The use of excellent plans and schedules leads to the improvement of management efficiency towards the abovementioned goals, and thus to the reinforcement of the overall competitive strength of our company.

By implementing the project we obtained a sophisticated and efficient tool thanks to which we became highly term reliable, flexible and a fast supplier. The results of the project thus significantly contribute to the fulfilment of longterm strategy of TŽ, which is the transfer to more demanding markets (especially the automotive industry environment), where nobody can be successful without these parameters. We can be proud of good management of the project also because of the fact that its results are unique,

because according to your knowledge we are the first in Europe who executes with such a strong tool for management support.



### **TŘINECKÉ ŽELEZÁRNY - Introduction:**

Třinecké železárny in Třinec, which was established in 1839 by the Archduke Charles Habsburg of Austria, has since 1996 been a fully privately owned joint stock company. Its majority shareholder is Moravia Steel a.s. The integrated plant produces annually 2.5 million tons of steel, which is more than a third of the total production of steel in the Czech Republic. High quality steel is hotrolled on four rolling mills in Trinec and one in Bohumín into a wide

portfolio of specialty long products like wire, reinforcement and structural steel, special bar steel, rails, wide steel or metallurgical semi-finished products. The group of companies that are the subsidiaries of Třinecké železárny, including drawing mills, tube rolling mill, chain-production factory, cast iron and steel foundries, engineering works then contribute to increase in value of the rolled product.

### Focus of this issue:

## **Success Story** of the Czech **Steel Company**

This entire issue is dedicated to the system of advanced planning of metallurgical production at TŘINECKÉ ŽELEZÁRNY, a.s. (Czech Republic). Inside the magazine you will find information about the history of such a project, what obstacles must be overcome, what time duration must be considered, what process changes are associated with the project and especially what results or benefits were brought about by the new planning system for this company. Top managers of the metallurgical enterprise as well as implementers and users of the system present their view on the matter here.

The project that is presented here belongs to those, in which all the involved can take pride. It is not because this project was awarded a prestigious prize (as the only European project from the manufacturing category it became the "Laureate" of the Computerworld Honors Program for 2007), but especially because the results achieved by the operation of the APS system mean value of cardinal importance and significant competitive advantage. I believe that when you get acquainted with the contents of this issue, you will agree with me.

The path to this success was not an easy one at all. The demands on the implementers were very high. We therefore take this opportunity to thank our colleagues from Třinecké železárny for their efforts and approach to cooperation. The opportunity to work with such an advanced team was always our dream - thanks for making it come true.

> Dalibor Konvička Chairman and CEO, LOGIS



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# **OBJECTIVES** OF THE PROJECT

### look back at the project beginnings (august 2005)

In connection with commencement of the project for advanced planning of metallurgical production, Třinecké železárny released press news in August 2005. In order to explain the expectations of Třinecké železárny at the time they entered the project, to our readers, we look back at the project beginnings and we include the opening extract of the press news where we quote Ing. Jan Lasota, member of the Board of Directors and sponsor of the project.

### WHAT IS THE GOAL OF THE **PROJECT**

Through achievement of high operational excellence to improvement of complex customer service

experiencing ever-growing We're pressure applied to steelmaking companies to provide their customers with high-quality products with still greater promptness, reliability and flexibility.

What was good enough yesterday, is on the verge of being too little today, and will not suffice tomorrow. A great deal has been done in the department of quality enhancement and we have a lot to be proud of. Now, we've decided to concentrate more intensively on how

the needs of our clients may be accommodated by providing them with attractive and reliable delivery dates.

And it's here that the company still leaves a lot to be desired. We can hardly expect to be prompt and reliable with regard to our customers without making promptitude and reliability the essential attributes upon



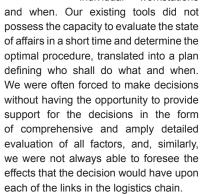
what we must not forget in so doing is that improvement in this domain must be achieved with high efficiency—in other words, high speed, reliability and flexibility must not cost us 'all the funds'. We must learn to achieve it at low costs. We know this is a formidably difficult task that, in a way, reminds me of the attempt of major automotive companies to develop engines displaying the highest possible power with the lowest possible fuel consumption. Similarly, we have to tune our company-wide process of order fulfilment in a manner as to ensure that it yields high performance while keeping the costs low. This is the goal of the project we're about to launch.

When implementing the project we won't dispense with highly efficient management methods. Advanced our plant. How much importance we ascribe to the project is clearly shown by our choice of the best available technologies and suppliers. We believe that the advanced planning project is an important step that will lead to further improvements in the competitiveness of our company results in performing for our customers. As a result, we will be able to perform in a faster, more reliable manner while retaining a better overview of the process than is the case now.

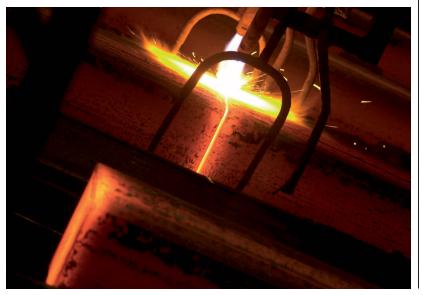
### WHAT WE WILL IMPROVE THROUGH THIS PROJECT

Through the high-quality planning, we shall increase the management effectiveness

> Order performance is a rather complex and complicated process at our plant. A number of time-dependent effects and limitations factor into it. The existing management tools did not make it possible for us to reflect these limitations to the necessary extent when making decisions what operations should be done at the individual workstations



The solution will allow us to reveal pending threats in time and adopt measures to eliminate them. We're convinced that a more precise and sensitive management resting upon optimised plans and schedules will help us to yield favourable conditions to achieve better operational results in fulfilling our orders. As a result, planning methods will have a key role we will be able to perform in a faster, to play as well as the ability on our more reliable manner while retaining a part to employ the technologies in the better overview of the process than is the



# **PLANNING PROCESS**

Zbyněk Ondryáš, Solution Architect, LOGIS

The APS solution currently forms an integral part of a complex information system for the company with focus on efficient support of corporate processes, especially in the area of production and sales. The goal of the planning process is to ensure such information support that can be used for efficient management. On the basis of the results of planning, work instructions are issued and submitted to the relevant personnel of the company in various forms, whose compliance then leads to achievement of goals in management - in our case maximum term reliability of supplies, with the most economic production process possible.

This is followed by capacity planning of individual orders with emphasis on meeting the required deadline for shipment. In the case of problems or complicated situations, there is a possibility of communication between the planner and sales agent. Schedule tuning is in this stage is carried out especially from the rolling mills against the material flow up to the steel works. The goal of this stage is to specify precisely the requirements for primary steelmaking in terms of quality, quantity and deadline. This stage is realized by the i2 Factory Planner module.

Production Planning

### **DAILY PLANNING CYCLE**

The basis of the planning process is the planning cycle, which consists of several planning stages. In the course of daily planning cycle there is an entire series of mutually synchronized activities, whose result is

- updated schedule of production
- updated schedule of steel
- of verification of order feasibility

of further planning stages.

### **Material Allocations**

In the early morning hours, the automatic allocation of available material at the

semi-product level is initiated. The result of automatic processing is the allocation of material to orders, in which high reliability of correct allocation of available material is achieved by meeting the defined criteria. The proposal of possible allocations is carried out for other orders.

The users coming to work already have the result of automatic processing available. After a fast check of the result of automatically performed allocations the users focus on selection of the most suitable material for the yet uncovered orders from the prepared offer of suitable candidates Allocations carried out in the close horizon

are automatically locked. The users however have the option to lock also selected allocations beyond this horizon. This stage is accomplished by the i2 Material Allocator module.

### **Production Planning: Line Balancing**

planning process continues with the stage of corporate planning of production capacities. The plan automatically reflects the allocations of material and previous production. One of the important tasks of this stage is the specification of the plan of availability of production capacities and campaign plan on key rolling mills with regard to actual and expected order content.

corrections or additions to the schedule with regard to actual production results at the steel plant and updates requirements for the steel plant. For the remaining requirements, an optimized steel plant schedule is automatically generated. The scheduling also takes into account the requirements for replenishment of safety stock for products of the steel plant. The resulting schedule is thoroughly analyzed by the users and tuned as necessary to react to unusual circumstances. This stage is realized by the LOGIS Caster Scheduler module.

of the schedule, the users can make

new products produced by the steel plant immediately after their input in the information system, and subsequently allocates these products to individual orders. Usually the allocation takes place as planned by Caster Scheduler. In case of discord between the schedule of the steel plant and actual production, it is possible to search quickly for optimal match between the material produced and order requirements.

intervals receives information about

Further sub-processes allow for asynchronous work in the area of preparatory allocations of material and preparatory and operative changes of the steel plant schedule. Thanks to

continued on page 5

especially the following:

- information about the results

The daily planning cycle is initiated after midnight by preparation of input data for the APS system in the resource data areas. The basic resource area is the company ERP system from SAP. Input data are transferred to LOGIS Metals Matrix, which provides for their control, fusion with precisely defined areas of results of the previous planning cycle, and initial processing for the purposes

### **Steel Plant Scheduling**

A deital Allocation

Plan Finality is

The requirements defined for the steel works by the previous stage of planning of production capacities are the most important input for the steel plant scheduling stage. At the beginning of this stage the users will conduct an analysis of the initial status, which includes evaluation of new requirements for primary steelmaking and actual status of fulfilment of the closest schedule horizon. In the locked horizon

### **Production Planning: Production Plan Finalization**

The resulting schedule for the steel plant is then locked in to the production planning horizon, and forms a limitation on the last stage of the planning cycle. which is the finalization of the production plan. The planners in this stage focus on evaluating impact of the schedule of the steel plant on the overall plan. After tune-up of the positions of orders on key rolling mills their detailed arrangement is carried out, in the course of which the order of production of the individual manufacturing orders on each resource is specified on the basis of defined rules. This stage of planning also includes the compilation of production batches in annealing furnaces, and load adjustment for all downstream operations. If necessary, the planners have the ability to generate and evaluate several alternatives to the production plan. This stage is realized by the i2 Factory Planner module.

### Finishing operations

After final approval, the resulting plan is stored in LOGIS Metals Matrix, from where key data are transferred to SAP ERP and the information systems for production management. The final plan will be used for defining the initial status of the next daily planning cycle.

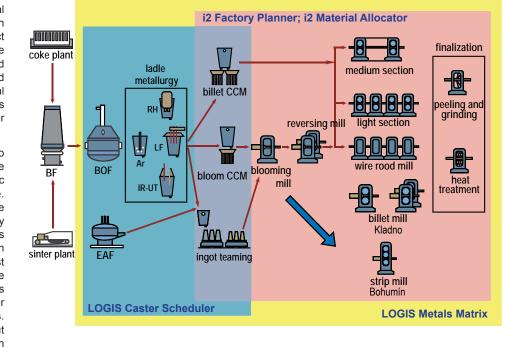
Within the area of LOGIS Metals Matrix solution, the data representing the final plan are processed for the purpose of presentation in formats suitable for various groups of end users, including historical tracking of key performance indicators.

### **ASYNCHRONOUS PLANNING ACTIVITIES**

Apart from the basic planning process the TŽ users also make use of several planning sub-processes that work in parallel with the basic planning process.

One subprocess plays an important role for timely allocation of steel plant production. It is a process that in defined

### **Production Flow Coverage**



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# **RESULTS ACHIEVED – improvement** of delivery competence and operational efficiency

Bohuslav Sikora, Production Manager and APS Project Manager, TŽ

The APS system was put in routine operation at the beginning of 2007. As in the case of each solution that brings about relatively cardinal process changes, the first months of operation were associated with tuning and stabilization of the planning results. Gradual improvement of the monitored performance indicators is evident in some charts included in this

### **INITIAL COMMENT ON THE SITUATION - INCREASE OF COMPLEXITY**

To assess the amount of success it is useful to know all the substantial circumstances, which in the TŽ situation played an

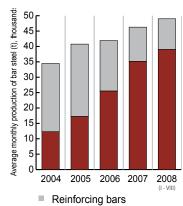
important role. That is why before I mention some parameters documenting improvements achieved by use of our APS system. I consider it important to mention some of these circumstances, especially some trends that have been manifesting in recent years. The strategy of TŽ consists in specialization towards an increased share of products with added value, especially automotive, railway transport and wire products. This becomes



**Bohuslav Sikora** Production Manager, TŽ

evident by the fact that average volume of one order is dropping - this increases the amount of orders with low volumes and thus the complexity and exigency of their processing. Approximately 50% of the orders have volume of less than 10 tons, 15% less than 5 tons. The second trend is the significant increase of the share of high grade steel (SBQ) products in total production. We therefore observe an increased share of orders with more

### **Increase in complexity: Share of SBQ Products** in Total Production: **Light Section Mill**



High-grade steel (SBQ)

technologically demanding production requirements (in the period from 2006 to 2008 there was a growth of the number of steel grades by approximately 30%). Both the trends mean an increase of complexity in the management of the order fulfilment

The growth of share of SBQ products brings about a significant increase in complexity of planning, both in terms of capacity planning (very complex material flows with many bottlenecks, requirements for synchronization of operations, bundling of requirements in production batches in annealing furnaces and evaluation of external co-operations), as well as in terms of allocation of orders to the steelmaking charge (continuous increase in the share of high quality demand in the product portfolio, especially in the area of highgrade steel with a high ratio of orders with small and medium volumes up to 10 tons,

and with considerable logistic limitations of storage areas).

If we continued using our original management system in such a situation, these changes in product mix would inevitably reflect in impairment of term reliability, extension of lead times, as well as lower production efficiency (for example increase of work in process inventory). Also it can be seen in several other parameters that show that before the application of the APS system there was an year by year decrease in due-date reliability (see comparison of the average volume of delayed orders), as well as impairment of economy of production efficiency which is shown by a year by year increase in production delays in the steel plant.

> The complexity production management and planning is also considerably affected by the fact that the environment is production to order Unallocated final products are not kept on stock

### **ACHIEVED IMPROVEMENTS**

Our goal was to achieve higher efficiency in the management of the

order fulfillment process by application of an APS system. I believe that the achieved improvements met our expectations.

In the following examples we will show how the use of the APS system manifested in selected company operations (Light Section Mill, Steel Plant) and within the entire enterprise. We will focus on the period from the APS "go live" until August 2008. In the end I will also describe some of our experience regarding use of the APS system in a time of crisis.

Apart from the data about improvements mentioned below in this article, I would like to emphasize that the use of the APS system significantly supported consistent focus on individual orders in our production process.

### **Improvement** at the Light Section Mill

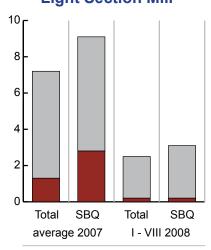
Light Section Mill is one of the key production capacities, as it produces a strategic group of products for the company (SBQ category products).

With the knowledge of significantly increasing demands for planning of the above rolling mill, it is possible to illustrate the immense contribution of the APS system by the fact that we managed to maintain a stable level of semi-finished inventory ahead of the

The support of the planning process by the APS solution allowed for increase of the throughput of the key bottlenecks of the operation. This trend was apparent for example in the increase of the efficiency of annealing furnaces.

The most important contribution was unequivocally achieved in the area of completing of orders on time. Yet in the year of implementation we managed to achieve 93% reliability within the entire portfolio of the rolling mill. whereas in the area of SBQ category products the reliability achieved 91%. In the course of subsequent year the reliability achieved was 97% even for the products of SBQ category, which impose high demands on the planning

### **Delivery performance: Light Section Mill**

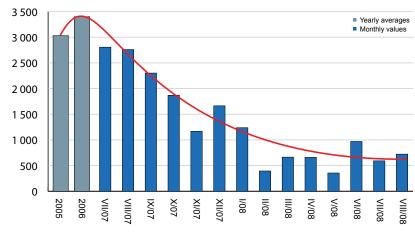


■ Commercial Delays (%) ■ Production Delays (%)

process. The evaluation differentiates so called commercial delays and operational delays. Commercial delays are caused by change in the requirements of the customer in the period when the production could not respond to these changes. Operational delays are caused in processing of orders in production.

The measurement of success in meeting order deadlines is based on a delivery commitment of a specific day. The overview implies the tendency to increase the precision of delivery performance by decreasing of the share

### **Delivery Performance at the End of Month: Light Section Mill**



### Improvement at the Steel Plant

For Třinecké Železárny, production of steel is an important area that has a substantial influence on the overall production efficiency. An important indicator of the steel plant production efficiency is the average sequence length at the continuous casters. An increase of average sequence length enables a decrease in the costs of production, with simultaneous increase of the total performance of the steel plant. The achievement of a good level for this indicator is especially difficult due to the following factors:

- · necessity to produce a large variety of steel grades, taking into account special requirements of individual customer orders
- · high share of small orders in proportion to one heat, let alone to the minimal size of a tundish lot

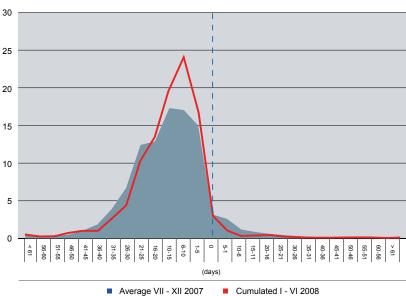
We evaluate this parameter as the difference between the theoretical maximum and the planned sequence to decrease the difference between the theoretical maximum and the planned sequence lengths by 60% in 2007 and by more than 70% in 2008. The application of the APS solution therefore allowed for achievement of a very significant improvement of this production efficiency indicator in a relatively short time.

### Improvement of Performance of the Entire Company

In 2007, Třinecké Železárny managed to achieve delivery performance at the level of 91% for all the products within the entire company. In case of SBQ category products the achieved delivery performance was 89%. Yet in the course of the following year 2008, when the function of the system was very well tuned, we managed to achieve the delivery performance of 95% in the entire company, whereas at the level of SBQ product category the reliability achieved was 97%. According to the information available, we would not have to be ashamed of such a result anywhere in the world!

Frequently mentioned goals for advanced planning technologies include also reduction in lead times. Our lead times however remained approximately the same before and after the project. The cause of this consists in the fact that in our project focus on maximum term reliability of supplies without limiting of production capacities strongly outweighed the shortening of lead times. We therefore promise the customer only such terms that are realistically achievable.

### Precision of delivery performance: Light Section Mill



of premature orders. Results achieved length for individual steel grades, in this area are influenced by the fact where the theoretical sequence length that at the most workplaces of the order derives from the maximum length of realization process the production is realized in campaigns

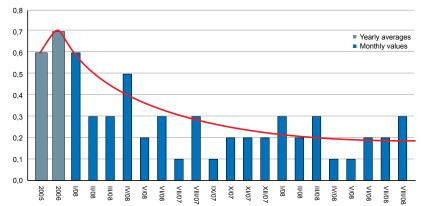
The evaluation of the level of improvement of this key corporate indicator is complicated--apart from the already mentioned influences--by the fact that before the implementation of the APS system, the term of delivery was linked to the end of specified month. Therefore the level of delay in delivery performance as of the last day of month was used for comparison. It is possible to see from the results that compared to 2006 the level of delivery performance increased by 40% in terms of volume of orders and by 25% in terms of the number of orders in 2007. In 2008, the delivery performance increased to 80% compared to 2006 in terms of both volume of orders and number of sequence given by the technology of production and the planned sequence length derives from the casting schedule at the continuous casters. Compared to 2006, we managed

### Support from the APS in the Time of Crisis

The above-mentioned results of the APS system applies to the period with high market demand. This period ended with August 2008. In the following months the steel industry was stricken by crisis: there was a dramatic drop of demand and steel prices. The situation in the market changed very rapidly.

The changes of the market conditions also had an impact on the defined goals of the company. Clear-cut priority has become the assurance of top level of customer service in order to exploit all possibilities in the market. In this situation, the company managed

### Wasted Tundish Life at Continuous Casting

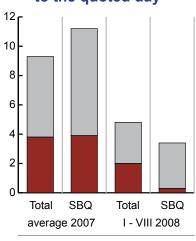


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# Overall delivery performance to the quoted day



- Commercial Delays (%)
- Production Delays (%)

to achieve delivery performance reliability of 99.6% (Spring 2009).

If you decide to increase the emphasis on some parameter in the system that is important for you, you have to consider the fact that the goal can be achieved only by breaking of certain limits and other associated partial parameters. In our case, the price paid for such high level of customer services would be a certain decrease in the level of tundish utilization at continuous casting in the steel plant, i.e. economic efficiency of the operation. It was however our decision and we accepted the price we had to pay for achievement of this unprecedented delivery performance reliability. This case also shows, I assume in quite a convincing manner, that we have the management system fully under control thanks to our APS. with which we are able to adopt each business decision with full awareness of

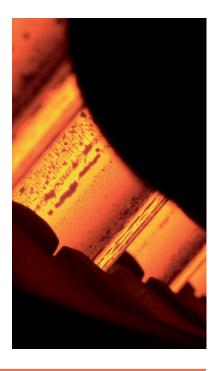
its complex impacts.

Presently we feel that our investment to the very high level of our due date performance of customers orders starts to pay off. Even though the metal companies around us still have serious problems with low levels of new orders, in our company, in course of several weeks, the level of new orders significantly grew. No doubt we will have to analyse the situation more thoroughly, still we are certain that the high level of due date performance contributes to the revival of our order growth.

# ACHIEVED IMPROVEMENTS - SUMMARY

We consider the development of corporate parameters specified in this article to be a convincing document of the efficiency of work with the implemented APS system. Even a layman must clearly see that the achieved values cannot be interpreted as random phenomenon explainable by a statistic deviation.

We are pleased that our delivery competence with the increased complexity of requirements and environment in use of APS system not only did not drop, but that we achieved very interesting improvements. We consider important also the fact that the economy of operations is improving; in other words the improvement of delivery performance does not take place at the price of increasing costs but these improvements are a result of increasing efficiency of the order fulfillment management process.



# **VIEWED BY KEY USERS: Before and after APS Implementation**

The implementation of the APS system led to substantial changes to the planning process and order verification process. It will definitely be interesting to get briefly acquainted with how the members of the TŽ team compare the original with current status. We therefore asked several key members of TŽ team for a brief summary, how the implementation of the APS system changed the main areas of the planning process.

### PRODUCTION PLANNING

### Stanislav Pražmovský, Chief Planner

Planning of production before the initiation of the project was focused especially on achieving the monthly volume of production

in important production units, and the company was realizing only average performance standards. Improved precision of the produ-ction plan was brought about by driving the plan from production campaigns on the final rolling mills. These production campaigns often took even several weeks, and contained a relatively wide product portfolio. The duration of production campaigns of

material flow



Stanislav Pražmovský Chief Planner, TŽ

production campaigns of a certain volume could--depending on concrete products required by the orders--differ considerably. This naturally caused problems with efforts to synchronize the production plans at various levels of

At present all the orders are scheduled on the basis of performance standards not only within the internal production capacities but also cooperative partners. In the process of planning activities the planners have a very good overview of all the future problems and limits in realization of the orders that can derive from the production possibilities of the steel plant, from the allocation of material for an order, from capacity issues in any point of the production process or exceptionally also from low-quality production. The support of the APS system enabled the planners to focus on substantial problems in the plan of order realization with the aim to meet the globally optimized plan.

### STEEL PLANT SCHEDULING

## Petr Morcinek, Chief planner of The Steel Plant

The supporting documents for scheduling of steel plant production were prepared by five people that were processing the orders on individual rolling mills and were preparing requirements for semi-finished products in so-called campaigns. By processing of requirements in campaigns

the team of five people was creating schedule of production in the steel plant (oxygen-converter steel plant and electric steel plant). This production schedule was with sufficient precision for the closest 4 to 7 days Beyond that horizon the precision of the schedule considerably decreased. The elaboration of the schedule required a very long time (manual calculation of the needs of individual grades, searching for suitable semi-finished products in stock, calculation of rough balances etc.). Furthermore the changes in requirements of the rolling mills or failure to meet the schedule of the steel plant in terms of the realized volume or quality were mostly causing the need for recalculation of the requirements and creation of a new schedule. This often

took place after the office hours and on weekends. the production Also dispatching of the steel plant had an uneasy role in case of need to decide quickly how to resolve the situation, when the company did not manage to produce a scheduled heat, because almost information about requirements for the steel plant was available behind the 1-2 week horizon. The evaluation of actual production included only the total planned volume.

there was no differentiation within the heat or sequence volume between material for concrete orders and for stock. This resulted

in an unnecessarily high production of inoperative stock of steel plant products.

At present the requirements for the steel plant are automatically generated on the basis of actual production plan at the follow-up operations behind steel plant. This principle enables the steel plant planner to work with precise requirements for the steel plant not only in the scheduling horizon, but in the entire horizon of

order planning (4 months). Thanks to a good support by means of the LOGIS Caster Scheduler solution the steel plant schedule is now prepared in the horizon of 40 days, whereas a very high quality schedule is tuned up in the horizon of at least 14 days. The schedule of steel plant is not static, but each day it is revaluated according to actual situation. Apart from the increase of quality of the schedule of the steel plant the company also managed to provide concurrently a substantially higher level of support for operational decision-making at the production dispatching of the

### MATERIAL ALLOCATION

### Bogdan Konderla, Light Section Mill, Chief Planner

Production from the steel plant was put into inventory of semi-finished products without a link to a concrete order (anonymous production). The material for a concrete order was then allocated from the stock of

semi-finished products only in the close time horizon before the initiation of the rolling campaign. Correct allocation of material to a concrete order within the information system was carried out only for rolled billets and for semi-processed material behind the final rolling mill. With this style of material allocation, we observed an incorrect allocation of material and sometimes pilferage of material by another order. The users

really did not have any information about planned production of semi-finished products, and they did not know until the very last moment whether the necessary material would arrive in front of the mill in time or with some delay. This was causing little room for the optimization of allocation of available material to open orders, and contributed to low reliability of

Bogdan Konderla

Light Section Mill

Chief Planner, TŽ

At present anonymous production without link to concrete orders is practically

eliminated. At the beginning of each planning cycle the material available on stock is automatically allocated to concrete orders. In more complex situations suitable materials are searched for, and the user selects the best ones for the concrete Allocation material is thus carried out dynamically in the entire planning horizon according to actual requirements of all orders, supported by a precise production plan for semi-finished product. An important factor is also that

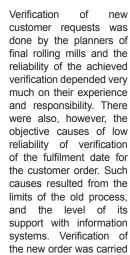
current allocations are systemically reflected in the supporting documents for management of production in the workshop.

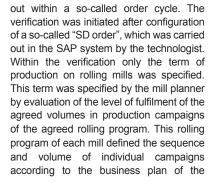
The employees responsible for mill planning, steel plant scheduling and material allocation in the past were fulfilling their tasks conscientiously and were trying to achieve the best possible results. With the former status of the planning process and levels of its support they could however achieve only local optimization without the possibility of its systematic reflection on the performance of the entire company.

Only after the change of the production planning process with the support of the APS system it was possible to achieve a substantially higher amount of cohesion of the work of individual participants to this process. The new process allows for creation of a production plan with continuously high standards, with emphasis on achievement of specifically defined global goals for the company.

### **VERIFICATION OF ORDERS**

Bohuslav Sikora, Production Manager, TŽ





it was only possible to determine the production within a one week window. Beyond that horizon the production in the steel plant was assessed only on the basis of gross capacity verification classified in standard grades and special grades. Only in case of a few manufactured and special grades was the possibility of their production estimated. The precision of estimates however was not sufficient and was greatly based on the experience of the employees that carried it out.

The effort of the rolling mill planner was to satisfy the requests of the seller, and even the "we will do it somehow" approach was not uncommon. The planner thus often assumed the responsibility for timely order processing ,and he in fact did not have the ability to ensure conditions for its realization, nor foresee possible impacts of committing delivery of an order in the context of existing order loads.

The above principle of order verification could have been sufficient in the time when confirmation of the term of order fulfilment with accuracy for a month and reliability of fulfilment at the level of 70 to 80% was a certain standard for a majority of metallurgical enterprises. The new strategic customers of TŽ, especially from the automotive industry, had completely different ideas about the required level of customer service. Our company had to cope with the requests for high precision of the confirmed term of delivery of the customer order, with high reliability of its compliance.

At present a relatively sophisticated process of verification of new orders is taking place, whose aim is the most accurate delivery quote possible. This reliable verification is achieved by considering of all the dispositions and limits in relation to the order at the level of the entire material flow from the steel plant across rolling



Petr Morcinek Chief Planner of the Steel Plant, TŽ



company. The term of rolling was derived from the required term of shipment using standard transit times for the given type of product. These standard transit times were not sufficiently precise especially for more demanding processing of product at preparation plants with many bottlenecks. Therefore there was an employee trying to save the situation based on his experience by correcting standard transit times by a qualified estimate.

Also the verification of the new delivery requests, from the point of view of their realization in the steel plant, was handled by the planner of the final mill and was estimated. Without sufficient precision,

up to finishing. The quality verification of a new order alone and its subsequent confirmation with the customer in line with the results of the verification would not however be sufficient for significant increase of the level of customer services. The compliance with the promised date of completion of the realization of the order is the primary goal not only of all the people involved in the planning process but also of the employees in production, who participate in its execution. The achievement of the strategic plan of the company was substantially supported also by the adjustment of motivation criteria for the employees.

steel plant.

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# **OBSERVATIONS** of the Production Manager

Bohuslav Sikora, Production Manager and APS Project Manager, TŽ

There are certain topics associated with the APS that are in my opinion interesting, but they are not enough for a separate article. They however illustrate well the view of what the APS project represents. Maybe some of the observations I mention below can be a subject of consideration for those who are thinking of a similar

### FROM THE VOLUME TO THE **ORDER**

The best description of the change in the planning process that was brought about by the implementation of the APS system, is the switch from volume planning to order planning. In the past, the primary goal was to achieve the required volume of production on the mill regardless of individual orders. Now the primary goal is to complete concrete orders on the mill according to a defined plan, which is optimized with regard to the business plans of the entire company. The employees expected a drop of the achieved monthly volume, but in fact in some cases the company managed to increase the volumes.

### WHAT WE CALL APS AND **HOW IMPORTANT IT IS TO** FIND THE RIGHT SUPPLIER

If we talk about the APS system, then we do not think of some separate individual software products that are labelled by their producers as APS products (or SCM products). Because if you purchase such products, you do not get any certainty that their use in your enterprise meets your expectations. It is similar to buying bricks - their value will emerge only when they form a building. The same bricks can be used to build a building where the people are satisfied, or vice versa. And thus the real value for the enterprise can be represented only by the APS system built during the implementation project, the system made of certain products as building blocks that are composed together with your implementation partner in a way to meet your needs in the best

### **MOTIVATION FACTORS**

The management of the company was fully aware of the fact that efficient application of the new corporate processes within the APS solution is not possible without the active support of employees, especially in the production sphere. With the benefit of hindsight we see that a very important means to achieve our goals was the change of motivation factors for the employees of the company. In the motivation system we therefore significantly reinforced the focus on customer satisfaction. The new motivation factors, which have a significant impact on the honus of individual employees, is the number of delayed APS system increases the requirements

orders. All employees, participating at each level of the production process, are now interested in timely order fulfilment. As an example we can take a situation when the company did not manage to provide for material for an order that is supposed to be rolled on the mill. Before, the employee would automatically include another order in the campaign, the material for which already lies on stock in front of the mill, in spite of the fact that the order would be expecting shipment to the customer for several weeks. The important thing was not to decrease the volume performance of the mill. Now, the solution of the given situation is different. The motivation system leads employees to verify the impact of their decisions using the APS system, and to search for a solution supporting corporate goals in

### THE ROLE OF PLANNER AS THE SUPPLY CHAIN **MANAGER IS GAINING CRUCIAL IMPORTANCE**

The questions I am sometimes asked imply a relatively frequent assumption, that the goal of the APS is to reduce the work of the planners to minimum. If this were the case, it would naturally lead to minimizing of their responsibility. The truth is different. With the ongoing implementation you will find out that their work was not reduced, on the contrary. its volume even increased, but especially their responsibility rose considerably. Thus the value and the importance of their work increased. If your planning process is able to create a really efficient plan, whose use is advantageous for the company, then the planners become real managers of the company.

In the past the planner was carrying out to a certain extent a routine activity. He placed a new order in a certain campaign with regard to standard transit times and this was the end of his responsibility for fulfilment of the given order, until the time when the charge for the given order actually got in front of the mill. The routine activities are now carried out by APS system instead of the planner. The planner is thus able to see the problems with fulfilment of orders and find out the cause of potential probelms. Together with the APS system he subsequently carries out the optimizations and searches for the most suitable solution of indicated problems. Each intervention of the planner with the plant can immediately be seen in the APS system, with all the consequences. The important aspect of the APS system consists in that it leads the user towards transparent communication. The APS system keeps evaluating the actual and potential problems and forces the user to solve them. The best solution to a given situation often results only from the communication with more stakeholders. From this point of view, it is possible to say that the introduction of the

for capabilities of the planners and their communication skills. The planner is today a member of the team focused on the overall optimization of plant performance.

### **INEXHAUSTIBLE SOURCE OF VALUABLE INFORMATION**

The APS solution provides much information for internal customers of the corporate processes associated with fulfilment of orders. The employees from operations have detailed information about the planned production of the steel plant, rolling mills and preparations plants in close and more distant horizon. The employees from the sales department have detailed information about the actual status of a concrete orders in the stage of planning and fulfilment. In the past, users could obtain certain information only via a telephone queries or ERP production results. Now there are available information portals providing forward visibility to planning issues.

### **OUR APS - SOLUTION TO EVERY WEATHER**

There is a question whether the APS solution that was implemented in the TŽ company brings about important benefits only in the period of high demand, or whether it is an important factor of efficient management of the company also in periods of unstable or decreasing demand, and in periods of fierce market

The implementation of the APS solution allowed for the achievement of crucial changes in the approach to the planning of plant operations, and engineered the new corporate processes. As always, the actual situation of the market outlines the goals that must be achieved for the company. The experience gained so far confirmed that we managed to implement a solution that is able to adapt to changing strategies of the company, and can generate a plan that corresponds to current reality.

### **EVALUATION BY OUR CUSTOMERS**

Třinecké Železárny was not perceived in past years as a particularly reliable supplier. The management of the company however did not want to content itself with only average evaluation from customers. Today we know of the high term reliability of our deliveries, not only because we measure it ourselves, but because our customers confirm an important increase in the reliability of order fulfilment. Especially in critical market conditions, we consider the APS system to be a competitive advantage for Třinecké Železárny



# **BUILDING BLOCKS** of the APS system

Zbyněk Ondryáš, Solution Architect, LOGIS

The APS system implemented in TŽ is built with use of the following application software products:

### **LOGIS METALS MATRIX**

Metals Matrix enables complex modelling, monitoring and management of the planning process, integration services handling external and internal integration, data quality control, data processing and completion, management of Metals specific functional requirements, and standard and custom user overviews of various aspects of the plan or planning process. Metals Matrix is a basic module that creates environment for work of other products.

### **i2 FACTORY PLANNER**

Factory Planner generates a balanced, feasible production plan for the operation. It provides an overview of planned production, inventories and order loads, timely information about potential problems and tools for their optimal solution. Factory Planner automatically and immediately reflects plan changes made by the optimizing algorithm and manually by the planner.

### LOGIS CASTER SCHEDULER

Caster Scheduler is a tool for creating optimized, detailed production schedules for steelmaking, ladle treatment and continuous casting. It is equipped with efficient optimization algorithms for automatic generation of the schedule, and provides comprehensive schedule visibility and easy user access for manual tuning of the schedule. It is able to rapidly generate schedules over relatively long time horizons. Caster Scheduler allows for modelling of the complex rules and limitations governing chemical composition of heats and detailed casting sequences.

### **i2 MATERIAL ALLOCATOR**

Material Allocator is used for the assignment of available material to individual customer orders. Evaluation of allocation options is based on a comparison of the individual attributes of available material with the attributes required by the order. Material Allocator algorithms aim to minimize the cost of satisfying open orders. It can be used in both automatic and manual mode.

### **Producers of the products used:**







continued article "PLANNING PROCESS" starting on page 2

these sub-processes, it is possible to efficiently use the working time of all the participants of this very sophisticated planning process.

### **ORDER VERIFICATION PROCESS**

A consistently high level of customer service was one of the most important reasons TŽ management decided to implement the APS system. During implementation of the APS system and set-up of its operation, the emphase put on a high level of term reliability in fulfilment of orders as one of the highest priorities in plan compilation. It is exactly this area, where is it especially apparent how the APS solution influenced the corporate processes of the company in several departments: sales, technology, production planning and production operations.

The basic principles of achievement of term reliability in the fulfilment of orders can be summarized by the following

### 1. Evaluating of all the new customer requirements in APS

Each and every new customer shipment requirement must be thoroughly evaluated with support of the APS solution, considering all of the actual dispositions and limits in the production area. This also applies to orders order changes. In the evaluation it is necessary to consider already confirmed orders so as not to endanger their feasibility in terms of deadline fulfilment.

### 2. Confirming exclusively based on evaluation

Shipment confirmation for new or modified orders should be carried out based on the evaluation of these orders within the APS solution.

### 3. Preserving of term feasibility in all the planning activities

In performing all of the planning activities, the effect on reliability of orderfulfilment should be consistently monitored. All the potential effects on the order realization plan are evaluated in this manner.

### 4. Respecting of the plan in realization

In realization of production the specified plan should be consistently respected, the personnel should take an active part in solving of problems with order delay and participate in specification of optimum solution for the order with forecasted delay, to eliminate the delay in the course of manufacturing.

The term reliability level achieved in TŽ by application of the above principles most probably documents best the efficiency of the applied process of verification, planning and production of orders.

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# **IMPLEMENTATION**

Tomáš Vojtík, Executive Director, Project Manager, LOGIS

### **PROJECT SCOPE SPECIFICATION**

The goals of the project, together with the key requirements for the solution, were specified within the business definition stage of the project. The endurance test of the common project team of LOGIS and Třinecké Železárny was the specification of the scope of the project, which meant a unification of the views of us as the supplier and members of the customer project team regarding the scope of the project. The key requirements for the solution were elaborated in a detailed manner for each area of the solution: planning of metallurgical production, material allocation, steel plant scheduling, plant production planning process, and integration of the solution within the existing IT infrastructure of

for planning of the confirmed orders and for verification of new requirements. An enclosed planning loop was achieved (planning cycle continuously based on the results of the previous cycle). Also department process changes were completed in order to be able to proceed with the routine operation of the APS system.

Stage 5: The fifth stage was carried out in parallel with the fourth stage, but part of the activities were carried our continuously also in the earlier stages. This stage included activities focused on refining detailed scheduling of production of the steel plant.

fell mostly within the responsibility of TŽ. Nobody could hide in the mist of any lack of structure. Such a system leads to a high pressure on all the involved and if there is a weak point on some side, then it is quickly revealed and necessary countermeasures can be adopted in time.

It is evident that the demands on the implementation team were really very high and without a devoted approach by both teams it would have not been possible to put the solution into routine operation. When working under high pressure, it was extremely important that both parties managed to conform their behaviour to a common priority: achievement of project goals. The effect of this was that in critical situations, when some of the activities were not as successful as expected and it seemed that the timely achievement of the goals would be jeopardized, no one was losing time pointing out and emphasizing of mistakes of the other party, but everyone jointly concentrated on the elimination of the threat. This approach had crucial importance for the total success of the project.

# **A Prestigious Award**

The Project "Advanced Planning of Metallurgic Production in Třinecké Železárny, a.s." as the only European project from the manufacturing category became the "Laureate" of the Computerworld Honors Program for 2007 (Washington, D.C., 4. 6. 2007)

Read the full story at

http://www.cwhonors.org/viewCaseStudy.asp?NominationID=234 -

### The Computerworld Honors Program Honoring those who use Information Technology to benefit so

ORGANIZATION:

Trinecke Zelezarny a.s.

Advanced planning of metallurgic production in

Trinecke zelezarny a.s

**Short Summary** 

CATEGORY:

The company realized a project of advanced planning in a demanding environment of a metallurgic company with an outstanding variability in the parameters of final products (up to several hundred thousand) and multilevel mode of production.

The planning deals with the orders for finished goods, where the number of combinations of demanded parameters reaches several hundred thousand, orders for multistage production of intermediate products as well as the production of liquid steel and its continuous casting. At the same time the order requirements with the volume from several tons to thousand of tons are lined to melts of 180 tons in sequences for continuous casting of steel so that they are chemically compatible and utilizable. The planning system manage all the material and production capacities in the process of the different cycles of production with taking into account the chemical composition and other properties given the demands of customers.

A project of planning production of such a comprehensiveness is unprecedented in



complexity of the entire NOMINATING COMPANY solution and its influence on the efficient operation of the company, it was best to implement the full scope

in stages. The APS system was launched in a period of several weeks during which the APS application was gradually extended from the initial defined segment of the product portfolio to the complete portfolio and from the first selected mill up to all the key operating units of the company, whose management is covered by the APS system. Every

**PUTTING INTO** 

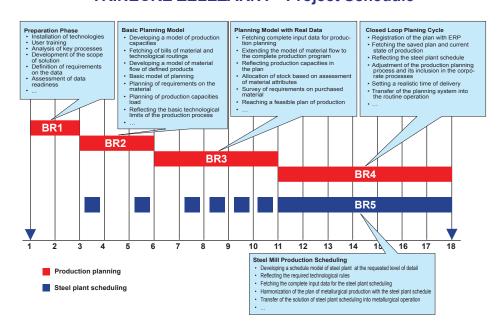
With regard to the extreme

**ROUTINE** 

**OPERATION** 

and necessary measures were adopted in order to ensure proper function of the system.

### **TŘINECKÉ ŽELEZÁRNY - Project Schedule**



Třinecké Železárny. Our view of the scope of the solution derived from best practices in the area of planning of metallurgical production and experience from previous implementations. The view of the members of implementation team of TŽ, which was composed of future users of the system, came from detailed knowledge of the existing processes, problem areas, and ideas about the capabilities and possibilities of an APS system. Detailed elaboration of the scope of the project enabled us to decompose the gross schedule of the project into key milestones for each stage, by means of which we ensured the feasibility of the overall project schedule

### **GROSS SCHEDULE OF THE IMPLEMENTATION**

The implementation of APS solution was broken down into 5 stages:

- Stage 1: The preparatory stage, whose main objective was the detailed definition of the scope of solution and specification of the schedule of implementation linked to expected results
- Stage 2: The goal of the second stage was to create the basic planning model for the each workflow segment; TŽ thus gained a model of the daily planning and scheduling workflow
- Stage 3: The third stage allowed for initiation of testing and tuning of two important stages of the standard planning cycle - allocation of material and planning of production capacities - over the real data of the company for confirmed orders
- Stage 4: Within the fourth stage the entire standard planning cycle was completed in all its stages

### **PROGRESS OF IMPLEMENTATION**

The APS solution was implemented according to the LOGIS implementation methodology. The implementation was divided into several stages, whose planned results were systematically aimed at achievement of the required goals of the project. The management of activities in the course of project was clear and well structured.

The basis of management is the continuous elaboration of precisely formulated tasks for individual activities of the project team in a way that the fulfilment of these tasks would be a guarantee of timely achievement of continuous goals of the project.

processing is an immensely responsible work - it is evident that any mistake in the task assignment can significantly endanger the deadlines and budget of the project. The tasks were not trivial at all-- many of them represented a multi-page exact test written in an information scientific language.

Accomplishment of the tasks prepared in a detailed manner was also a very demanding activity that required considerable effort of the implementers. The validation of data did not only mean the assurance of data inputs, but also the verification of data quality (structure, internal links, completeness, values, ...). The entire team worked very conscientiously and the results of each step were very important for the practical application of the APS system in routine operation.

The system of management via tasks naturally leads to a high transparency regarding the responsibility for possible failure. If the task is not assigned in time according to the project plant or it must be significantly completed after its issue, it is a problem of project management and therefore problem of LOGIS. On the other hand the completion of the task

### THE WORK DOES NOT **FINISH WITH THE MOMENT** OF SWITCH TO ROUTING **OPERATION**

The switch to routine performance of the planning activities using APS solution definitely does not correspond with the moment of resolution of all problems and achievement of all the required benefits. In the first stage it was necessary to stabilize the entire solution and linked corporate processes. The functionality of the solution had to be tuned up and the users only then started to fully realize the impact of the implementation of APS solution on their work in all circumstances. On the basis of this experience it was necessary to finish the tune-up of the corporate processes in order to make them suit the individual groups of users, but especially to make them consistent for all areas. Only then did the employees of TŽ, with the support of the APS solution and new corporate processes, start to achieve stable results at the level of the

Relatively high intensity work for all team members accompanied the operation of the APS system for several months after initiation of routine operation. We do not assume that it is an unusual case. With such fundamental changes, accompanied by extraordinarily high complexity, it is not realistic to expect that the project work can cover all the possible situations into the tiniest little details. Thus the effort to save time and money in this stage would lead to a decrease of the value of the really achievable results. As with the start-up of new mill operating facilities, we advise all potential investors to consider learning curve costs in their budgets.







Occasional news edited by company LOGIS, focused on Advanced Planning Technologies and their practical application at industrial companies

LOGIS is a supplier of expertise services and information technologies focused on improving of business management and competitiveness. The deliveries are executed in the form of projects aiming at improvement of management effectiveness and development of business success at the customers' businesses.

Within the framework of their solutions, LOGIS applies advanced managing and planning methods and procedures (so-called best practices), including highperformance information technologies in the field of Supply Chain Management (SCM) and Advanced Planning and Scheduling (APS). The ERP category systems are also applied to support the goal achievement. The used technologies are either proprietary or from i2 Technologies (LOGIS is an authorized distributor of i2).

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