

Mining and Resources Case Study

See how this company saw \$250M USD in annual margin increase



Company Overview

Top Russian producer of thermal coal with an annual production volume ~100M tons

- Complex supply chain
 - Production: 30 mines; 30 coal enrichment plants; 40 coal storage areas; 150 finished goods SKUs; 80 production BOMs
 - Transportation and delivery: 25 railway stations; 35 ways to road transport between storage sites; 4 modes of delivery
- Diverse customer base
 - 500+ domestic clients purchasing in a mix of contract and spot, with opportunities for product substitution
 - 300+ export clients (~40% of volume) requiring specific qualities across 15 types of export blends with constraints on 4 qualitative characteristics





Key Planning Challenges

Sequential, Disconnected, Time Consuming Process

- Production, sales and financial plans created in sequence, making it impossible to meet all relevant restrictions and requirements
 - First: Production plan (only tonnes), developed by the Production unit in consultation with the Commercial and Financial blocks
 - Second: Sales and Delivery plans (tons, transport costs and revenues) developed by the Commercial department in accordance with the Production plan and in consultation with the Financial unit
 - Third: Financial forecasts (P&Ls, intercompany transfer prices) calculated by Finance after the Sales and Delivery plans approved
- Limited ability to holistically optimize plans or create and analyze what-if scenarios
- Long, arduous effort to balance production and sales plans
 - Consuming FTEs
 - Limiting business agility and increasing the possibility of error in the planning process

"We were attracted to the flexibility of Enterprise Optimizer. We can determine things such as where and how to blend coal, adjust plan based on customized multi-criteria optimization, and simulate financial flows."

> --Alexey Dmitrochenkov, Head of Planning



Project Focus

Integrated Business Planning: Tactical 3-18 mos.





Project Objectives

Increase Profit & Efficiency, Create Shared Context

The goal of this system was to increase the profit impact as well as efficiency of sales & operations planning

- Enable the use of optimization in planning activities to improve the profitability of sales and production decisions 3 to 18 months out
- Transition to an integrated model allowing production, sales, marketing and finance plans to be created and analyzed simultaneously (vs. sequentially)
- Reduce the planning cycle while improving the level of insights, opportunity analysis and comparison of multiple production and sales plans
- Ensure involvement of all key stakeholders (e.g. Sales, Production, Finance) in the planning process



Project Participants

Integrated Team Required

- Project Lead Sales & Operations planning team
- Commercial Department the head office, all regional branches and the trader organization
- Production Department in headquarters
- Economics and Finance Department in headquarters
- Strategy Department in headquarters
- IT Department in headquarters



Project Impact

Accuracy, Predictability, Agility & Profit

- Profitability: \$250m USD annual margin increase (4% of revenue)
- Customer Satisfaction: 100% customer satisfaction
- Planning Agility: Improved ability to quickly react to unplanned circumstances and events
- ✓ Resource Time: 200% reduction in required resource time
- ✓ Forecast accuracy: Production, Sales, Delivery, and Financial plans are the result of an integrated business model

"We will continue to use IBP to streamline our efforts for determining functionally aligned plans that optimize our performance objectives."

> --Alexey Dmitrochenkov, Head of Planning



An Intelligent, End-to-End Model





Confidential

Appendix A

River Logic Intelligent Model Details

- Time buckets (periods): 3-18 month horizon with 1 month buckets (period)
- **Production:** 30 mines; 30 coal enrichment plants; 40 coal storage areas; 150 finished goods assortments; 80 production BOMs; fixed costs and Labor/Hour
- **Transportation and Delivery:** 25 railway stations; 35 ways to road transport between the sites of storage; 4 modes of delivery: EXW, pipeline (CPT), trucking (CPT), railway delivery (FCA, CPT); cost of delivery/ transportation
- **Domestic Sales:** 500+ clients; interchangeability of coal on the domestic market with different prices (product substitution optimization); priority clients/client groups; mixtures available in customer warehouses; spot market
- **Export Sales:** 300+ clients (DAF, FOB, CIF, DES, ...); 8 seaports (the Pacific ocean, the Atlantic ocean, the Black sea); 6 railway border crossings (Europe); 30 stationary coal piles in ports; 15 types of exports blends; 2500 blends not-fixed BOMs; 4 quality parameters as blend restrictions: caloric content Q, ash content Ash, sulfur content S, nitrogen content N; linear relationship between price and blend caloric content Q; delivery of ships; fixed costs in ports; port rates (variable cost per ton); spot market; export prices driven by indexes
- **Solving Time:** 2.5 minutes for the annual model (12 monthly time periods)
- **Data Sources:** Master data from the SAP through IBM WebSphere; other data from web forms (web interface, 150 forms); Approved plans are transferred to SAP Business Objects



Appendix B

River Logic's Intelligent Model Includes Unique Mining Parameters

Blending with bonuses at the seaports:

- Every contract is limited by qualitative characteristics of the mixture: min Q, max Ahs, Max S, max N, which requires direct ratio constraints functionality
- Model blends for each ship, allowing modeling of different mixes for the same contract and customer but different ships
- Bonus calculation: prices have to be recalculated for each ship with the base price P0 for base caloric content Q0. So if the blend has the caloric content Q price will be calculated like P=P0 * Q / Q0, but the price growth will stop after Pmax.
- **Product substitution in domestic sales:** Deliver different coal blends to the same client, yet with different cost of delivery at a <u>different price</u>. The only thing that remains constant is overall demand in tons.
- **Sequential multi-objective optimization:** The client has approximately 15 optimization criteria ; Modeling approach requires:
 - Model the first criterion (e.g., an attribute),
 - Then solve model with objective function (OF) biased to the attribute,
 - Finally constrain the attribute with min total units equal to the solution found,
 - Then model the next criterion, change OF to the new attribute and solve model with new OF but with the previous attribute constrained, and
 - Repeat it criteria after criteria until we get to the last criteria EBITDA.
- **Aggregate limits:** The production plan should be influenced by the total volume of exports of specific coal. This can be modeled in EO through attributes and inter/cross attribute constraints.

