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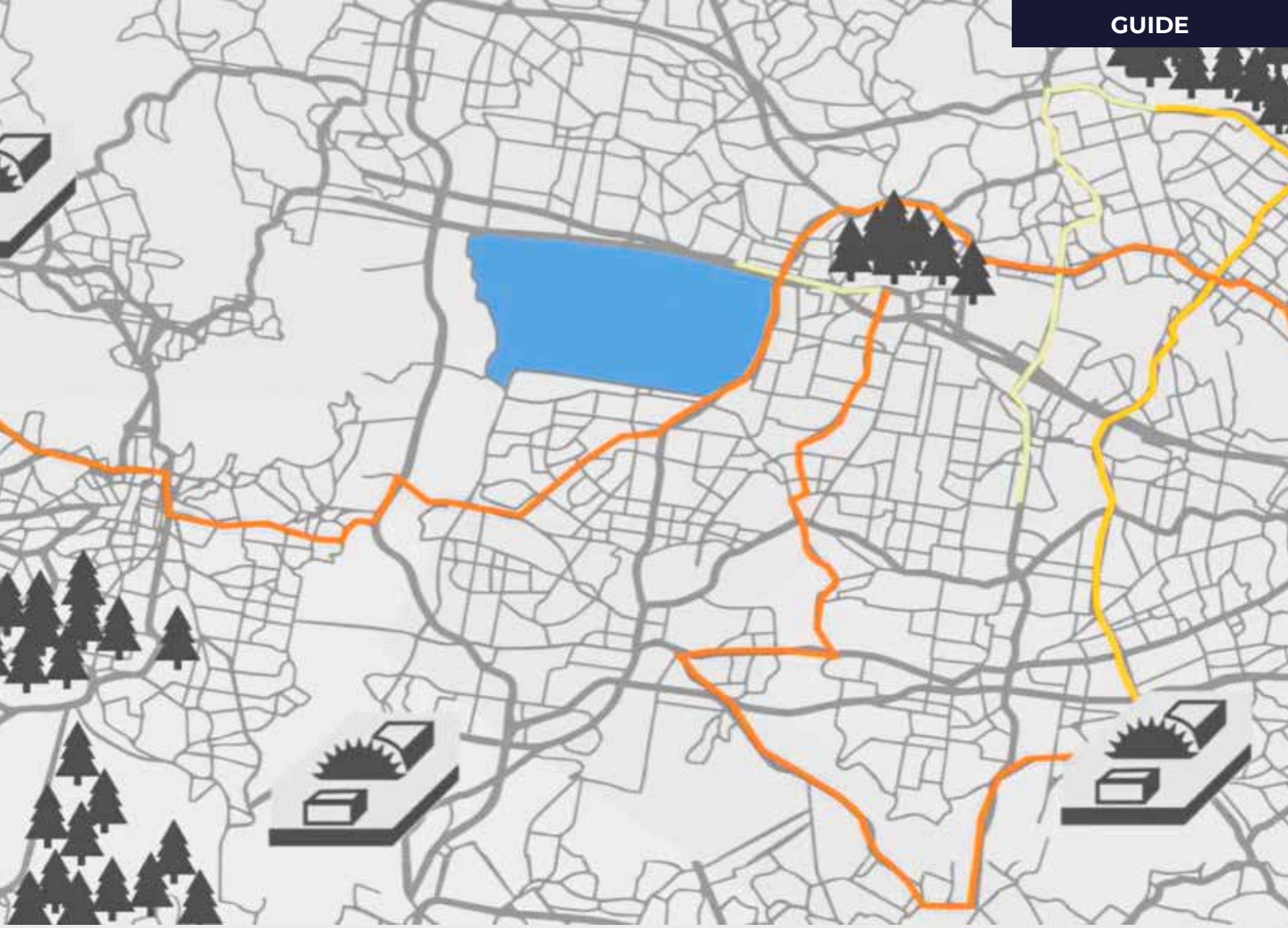

Tactical Planning Optimization in Forestry

Application and Value

A review of current tactical planning practices in the forest industry and the key benefits of analytics-based planning with Remsoft's optimization modeling technology – supported by quantitative results and global use cases.

Introduction

Arguably the most crucial level of enterprise management, tactical planning provides a foundation and guidance for short-term sales and operational planning (S&OP) and ensures alignment with organizational strategic goals.

The starting point for tactical planning optimization is a set of spatially assigned blocks that have been pre-defined for treatment. These are typically imported from a higher-level strategic plan and provide the foundation for short-term S&OP.

Learn about the framework and methods used for planning with Remsoft's Tactical Optimization modeling solution. Our approach, and solution for optimizing mid-term tactical-level planning is based on years of global expertise in forest planning, extensive client input and proven technology that's industry standard in forestry for planning and scheduling. Excellence in tactical planning is the vital link that connects strategic modeling to S&OP optimization, within an integrated lifecycle forestry planning approach.

Measurable Impact

From our collaboration with global forestry clients, there is a clear and substantive opportunity to add value to the mid-term, tactical planning space with optimization. In most cases, enterprise-wide, optimized strategic planning is a mature process: it's been our specialty at Remsoft for over 25 years, and model analysts around the world are using Remsoft's Woodstock optimization technology to achieve measurable impact within their organizations.

Remsoft clients that have expanded their optimization modeling, analysis, and forest planning beyond the strategic level to include tactical planning and S&OP are realizing measurable, enterprise-wide improvements, including:

- **Improved management of high harvest volumes** through data-driven decision support, the ability to model different scenarios and evaluate outcomes. One client was able to streamline and integrate planning across its supply chain, maximizing efficiency and forest resource sustainability.
- **Reduced working capital costs** through leaner inventory management across the supply chain, including reduced roadside holding times, minimized transfer yard stockpiles, faster turnaround on chip transfers.
- **Optimized volume allocations** that identify missed sales opportunities through supply chain analysis. One client gained a $100,000/year improvement in roundwood sales, and another client realized a 9% improvement in contract fulfillment through increased delivery accuracy and schedule execution.
- **Transportation cost savings** realized through smarter harvest scheduling and road access plans. A client generated a 4% reduction in haulage costs (€1,200,000/year savings).

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SECTION 1

Tactical Planning Defined

For clarity, let's define tactical planning. Basically it means breaking up strategic, long-term schedules and goals into manageable units of time and space that can be feasibly planned, given the complexity of operational implementation.

The Elements of Time

First, we must address units of time, including the tactical planning horizon, and the periods within that horizon that comprise milestones for planning review, analysis, adjustments, and reporting. Time periods and plan horizons will invariably differ by the size and type of an enterprise, and how its geographic region influences growth rates, rotation lengths, species diversity, etc.

In a broad context, consider the difference between these two forest enterprises:

- A land management company operating in the temperate forest of northeastern North America that deals with over 20 tree species, 40-60 year rotations, and deliveries of all harvested products to a web of external mills, vs.
- An integrated pulp and paper company in South America that manages its own eucalyptus plantations on 7-year rotations and consumes all produced fiber.

Obviously, these different enterprises will have different tactical planning horizons. While one may operate with 2–5 year tactical plans, the other may be operating on an 18-36 month tactical plan.

The Elements of Space

Second, we must address units of space, including what portion of the total land base to include, harvest block size and clustering requirements, feasible transportation routes, and spatial adjacency constraints such as maximum clear-felling block size or required green-up delays. Spatial elements are highly variable from region to region, and between different forest management enterprises; some of the most important can include:

- Harvest block size constraints and adjacency rules
- Seasonally-dependent harvest, road construction and transportation scheduling
- Harvest unit clustering requirements
- Crew movement cost minimization
- Product flow requirements throughout the supply chain

Managing Complexity

Finally, with time and space defined, we can consider how an enterprise may be (or would like to be) managing the overall complexity of tactical planning problems – that is, operationalizing a feasible plan that serves strategic goals. For example, clients using our tactical planning solutions are resolving problems in:

- **Spatial planning to develop harvest and silviculture treatment schedules**
- **Capital investment planning**
- **Harvest system scheduling**
- **Road building optimization**
- **Supply chain management (procurement, inventory control, contract allocations, deliveries)**
- **Optimizing forest products merchandizing patterns**

When assessing whether to implement tactical planning optimization, a key indicator is whether important business questions are not getting asked simply because the answers would take too long to find. Optimization modeling reduces risk by helping to answer complex questions and visualize different alternatives to quickly understand the impact of decisions. See the chart below for some of the questions answered and outcomes that can be achieved with tactical decision support.

Inputs

- Fleet capacity
- Harvest unit standing inventory
- Harvest levels and volumes
- Delivery points
- Satellite yards
- Existing road network
- Harvest, transport and road maintenance costs

Questions Answered

- How can we minimize delivered wood cost?
- What products can we produce to maximize returns?
- How can we allocate fibre optimally within and outside the organization?
- How can we minimize road maintenance costs and align road planning with harvest sequence?
- How can we sequence harvest blocks to meet requirements, while providing the necessary profile (size, grade) for each facility?
- How can we minimize crew movement to maximize uptime?
- How can we best allocate infrastructure and harvest machinery?

Outcomes

- Maximize profits and minimize costs by balancing harvest production, road maintenance and wood delivery with demand fulfillment
- Create mid-term harvest and allocation plans
- Manage wood flow from forests to mills and other end-users
- Assess the impact of changes to future wood flow and harvesting schedules
- Evaluate different options and scenarios to identify the best path forward
- View and analyze results in maps, graphs and reports
- Share schedules and results with other stakeholders
- Provide inputs to more granular operational-level plans

SECTION 2

Executing the Strategic Plan

A Brief History

Remsoft has been helping clients optimize their strategic planning for more than 25 years. Over the past 5 years, we've refined the shorter-term planning process. Working with forestry companies around the world has shown that operational and tactical-level planning are usually manual processes with no direct connection to their strategic plan. From our engagement with timberland managers, this has been identified as a significant management concern. There are questions and doubt that activities on the ground are not aligned with the strategic direction, which can cause significant enterprise risk.

What's a Strategic Plan?

The outputs of strategic planning models provide high-level business direction such as sustainable harvest strategies and volume flows, budget and cash flow estimates, key performance indicators, and spatially-defined harvest and silviculture schedules. These are excellent tools for developing landscape plans, estate management strategies, and organizational goals, but what about implementing the plan on the ground?

What to do with the Strategic Plan?

- How are strategic schedules converted into operationally-feasible plans?
- How can a strategic spatial schedule be transformed into a spatially-compliant, operationally-feasible treatment plan that serves higher goals?
- How are production and delivery schedules derived from estate-wide volume forecasts?
- What options are available to link timber management systems, forest management systems, GIS and other business systems into a unified, enterprise-wide planning tool?

Status Quo Tactical Planning

In answering the questions above, the underlying theme is: bridging the gap between a strategic plan and an operational plan requires a lot of effort. So how do those strategic plans get rolled out on the ground?

Generally, there has been no standard practice for tactical planning in the forest industry and a lack of continuity between high-level strategic planning and the day-to-day live operations. It is common to see planning systems go directly from long-term strategic planning to short-term operational planning - typically accomplished by operationalizing the first period of the strategic plan. This can lead to misalignment with strategic objectives and lack of guidance to operational planners, resulting in missed opportunities and increased risk.

Many tactical planning processes use multiple business systems with little or no integration, huge but fragile spreadsheets that are difficult to update or share with others, and decision variables that rely on expert experience to implement.

Praise for the Resource Planners

This is the space where Resource Planners apply their expertise, 'tribal knowledge', and tireless work to construct tailored plans for their organization's operations team. Being led through the tactical planning process by one these Resource Planners is to witness true genius. It's amazing what dedicated and innovative individuals can design from scratch, on a budget, and under constant pressure to keep ahead of the operation!

Most organizations have their own home-grown process that pulls data from a plethora of management plans, regulatory requirements, certification standards, company policies, inventory systems, GIS departments, and demands from the operations team. Given the complexity of the task at hand, it would seem reasonable that the planners would be using a sophisticated tool to do all of this, right?

The Spreadsheet Crutch

In fact, most tactical planning in the forest industry is spreadsheet driven. There are countless variations of Excel in combination with GIS and other business systems to produce huge, complicated, and fickle spreadsheets. These homemade data management systems work, and no doubt, they are getting the job done, but they are also unruly: difficult to sync and update, tough to track changes, hard to share and interpret across the planning team, limited scenario capability, low agility to react to changes, and challenging to provide visibility with. The key issue however is that they are manually operated.

Planners are faced with thousands of choices – each piece of a plan will likely include a suite of constraints and decision variables. So how is the tactical plan formulated? Planners manually evaluate as many options as time will allow, then apply reason and experience to decide on a plan that appears to offer the best balance of benefits through time. Of course this makes sense, and so where is the problem?

The One-Time, Best Plan vs. the Dynamic, Optimal Plan

The problem is two-fold:

1

A missed opportunity to select the mathematically ***optimal*** plan. Imagine using your expert knowledge to steer the power of a computer model that can evaluate millions of choices in the time that you or your spreadsheet may only consider a hundred.

2

A manually derived plan is a snapshot in time. Plans will change. Now imagine the computer model is ***dynamically linked*** to your business systems and can be automatically updated when plans change - a new run in the model produces a new optimal plan, adapted to the change.

Clients using our tactical planning optimization solution are realizing a 0.5% to 4% reduction in overall delivered wood cost, being unlocked by modeling their business environments with more agile, consistent, visible and transparent enterprise-wide solutions.

SECTION 3

Remsoft Tactical Planning Optimization

Remsoft's Tactical Optimization solution is purpose-built for forestry and powered by Woodstock optimization modeling technology – an industry standard platform used by government, consultants and forestry leaders worldwide. Refined and innovated over nearly three decades, Woodstock provides robust prescriptive analytics capabilities that can address multiple supply chain challenges, including planning and scheduling, resource and asset management.

Getting Started

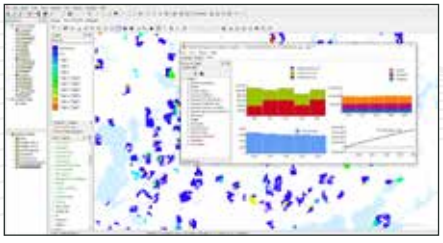
To get started with a tactical solution, you will need a realistic spatial schedule of pre-defined harvest units (blocks) for the time horizon you wish to plan (i.e. a 5-year tactical horizon requires 5 years' worth of blocks). Ideally these will be imported from a strategic model where landscape-level spatial constraints have already been optimized. If this is not your case, Remsoft can help you get started with our professional services.

As discussed, your tactical horizon will likely range from 1-10 years in length, depending on the size and complexity of your business structure and land assets. Once the tactical horizon is defined and the appropriate range of spatial blocks are imported, harvest and silviculture blocking is refined to meet more operational objectives while respecting spatial and operational constraints.

When a satisfactory schedule results, other important decisions and analysis can be considered by adding additional constraints and running alternative scenarios:

- Budget and cash flow forecasting
- Capital and infrastructure investment planning: roads construction, mill investments, harvesting equipment, etc.
- Setting resource and capacity thresholds
- Ensuring desired harvest product flows and setting allocation/delivery schedules
- Optimizing road building and maintenance programs

These forest business components form the seedling to timber, stump to mill supply chain – the balance of supply and demand, innovative forest management, and strategic sales networks – an exciting sector where small, incremental improvements can equate to millions of dollars in savings.



Fast Tracking Success with Optimization

With years of forestry experience behind us, and proven success helping clients solve multi-million dollar planning challenges, Remsoft has developed a Tactical Optimization solution that's purpose-built for forestry. Powered by Woodstock, Remsoft's Tactical Optimization solution is pre-configured to handle the complexities of mid-term forestry planning. You can tap into our expertise, where required, to get up and running with optimization modeling in weeks to start solving your specific tactical planning and scheduling challenges.

Regardless whether you're new to analytics-based planning with optimization modeling or just new to using optimization for mid-term planning, there's a path to accelerate your success with tactical optimization.

Forestry companies already using Woodstock for strategic planning can leverage the schedule from their Woodstock strategic plan to gain a higher granularity of detail and operability with Remsoft's Tactical Optimization solution.

Forest management and integrated forest products companies new to analytics-based planning can use tactical optimization as a way to get started with more agile, intelligent decision support for their forestry operations.

Structured tactical planning that connects all business systems and gathers input from all affected departments has become essential to forestry planning. Utilizing available data resources to add rigor to tactical planning and enable data-driven decisions supports your ability to increase operational feasibility, improve visibility and achieve strategic-level enterprise goals.

SECTION 4

Tactical Optimization Use Cases

Tactical optimization can be applied across a wide range of use cases. Consider these examples:

North American Use Case: Large Single-Line Kraft Pulp Producer

Managing a large forest area and complex supply chain, the client uses tactical optimization to efficiently manage the entire supply of wood coming into its mill. Reliant on an efficient and sustainable fibre supply to support its mill operations, they use Remsoft optimization technology to enhance the management of high harvest volumes by modeling different scenarios and evaluating outcomes. Their tactical wood flow model provides data-driven support for harvesting, scheduling, inventory management and transportation planning. It has also helped them optimize planning over a 3 to 5-year period, enabling them to plan with a holistic approach that answers critical questions, addresses challenges and considers the different aspects of the business. Tactical optimization has given company foresters a decision support tool to explore potential forest planning scenarios, and it's enabled them to leverage data to enhance operational decision-making and get more value from the data generated.

European Use Case: Large Land Management Company

One European client uses a 5-year tactical model with quarterly reporting periods to optimize harvest blocking, harvest system scheduling, and product delivery for a 450,000 ha land base. Two senior analysts centrally-plan the tactical schedule then roll-out the results to their 8 regional managers for review. The regional schedules are then ground-truthed by 16 resource planners (2 per region) using Remsoft's tactical planning solution, and sent back to central planning with their comments and revisions. This edited schedule is fed back into the tactical model for re-optimization and the output is a final, 1 year rolling plan that all people at all levels of the business have validated. Within 2 years of implementing their solution, the enterprise has improved the workflow process and communication between departments. Each business region enjoys improved success in reaching their objectives, while as a company, they have a clear vision on achieving corporate goals.

Eurasian Use Case: Integrated Pulp and Paper Producer

A client in Eurasia used their tactical model for spatial harvest, road and wood supply planning, optimizing the scheduling of felling units in coordination with complex road network planning to create the best harvest and delivery schedule from units to mills. The company has been able to improve road network planning for harvesting and wood supply, and reduce the cost of delivered wood, by coordinating the spatial harvest schedule with road network decision-making to minimize road maintenance costs. This has included using fewer roads per year to deliver annual harvest volumes and timing road infrastructure capital costs to align with harvest volume.

SECTION 5

Lifecycle Forestry Planning Approach

Thriving in today's complex and changing business environments requires more agile and accurate decision-making. Decisions based on data that can help you achieve outcomes faster and with less risk. You can maximize data intelligence by replacing spreadsheets and manual planning processes with a central planning system that connects your data and business systems to optimize your spatial schedule.

While strategic, tactical and S&OP optimization can each work in isolation, to achieve key objectives - you get the most value when everything is working together. The proven benefits of connected, lifecycle forestry planning include:

- Less time spent managing manual processes and more time available for tactical analysis to discover your most profitable path forward;
- More visibility across your supply chain, to quickly see and resolve bottlenecks, assess new opportunities and adapt to change;
- Improved data sharing, cross-departmental communication, collaboration and alignment

Optimization is the future of mid-term and S&OP forest planning, helping to simplify complex operating environments and unlock hidden potential in your business. With connected, optimized lifecycle planning, you can find opportunities to reduce costs, increase productivity, and solve complicated supply chain problems.

About Remsoft's Tactical Optimization Solution

Remsoft's Tactical Optimization solution is powered by Woodstock, an industry-standard platform for optimization modeling that includes intelligent decision-support with prescriptive analytics, flexible problem solving, scenario and capacity analysis. Purpose-built for forestry, our Tactical Optimization solution is designed to solve short- to mid-term planning challenges including: harvest and road planning, wood flow and delivery, capacity and budget planning.

Learn More:

Solution Datashseet - Tactical Forestry Planning Optimization
Software Features and Benefits - Tactical Optimization Solution
Platform Overview - Woodstock Optimization Studio

What can we help you achieve? Learn all the ways you can benefit from using Remsoft planning analytics software to improve performance and meet your business objectives.
www.remsoft.com/get-started