VÖLUR



Maximizing carcass value with Völur's AI technology

Significant value creation through optimal daily production plans for the meat industry

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About Völur

Völur is a global software company that is revolutionizing how the meat industry operates. Headquartered in Norway, Völur is on a mission to make the meat industry more optimized and sustainable with data and AI. By combining deep technical and industry knowledge, they use data and AI to empower meat processors with optimal sorting and cutting decisions to maximize carcass value throughout the whole value chain. Their solution creates value through a more profitable balance between supply and demand, increments in the value per pound of the finished products, meeting service levels towards customers, and up to 10% higher utilization of animals. Visit us at volur.ai and follow us on LinkedIn.

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Executive Summary

OPTIMIZING CARCASS SORTING AND CUTTING WITH DATA AND AI

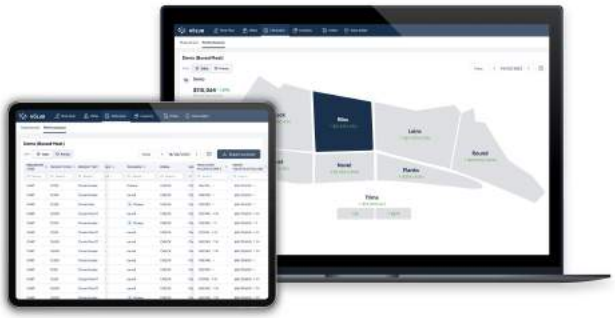
Optimizing production processes has become crucial in today's dynamic market with changing consumer preferences, environmental regulations, and animal welfare standards.

Völur's competitive advantage

Völur has taken on the challenge to help meat producers harness the power of data and AI technology to maximize carcass value and ensure optimal utilization of each animal. With Völur's AI solution, we are revolutionizing the industry, enabling meat producers to make data-driven decisions and achieve unprecedented sustainability and profitability.

Smarter daily production planning

Our advanced AI technology enhances sorting, cutting, planning, and scheduling processes, resulting in benefits such as a more profitable balance between supply and demand, increments in the value per pound of the finished products, meeting service levels towards customers, and up to 10% higher utilization of animals.



At a Glance

The Problem

- The complexity of meat value chain
- Creating an optimal plan has not been humanly possible
- The industry is using more animals than required and/or not properly assigning animals to products to satisfy demand

The Value

- 3% increased carcass value
- 5% increased sales
- Lowered emissions and less waste

> **"By leveraging Völur's AI technology, we believe we can increase the value of each carcass while satisfying our customers' orders."**

BRIENNE HEINRICHS

HEAD OF FINANCE, JBS USA

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The Problem

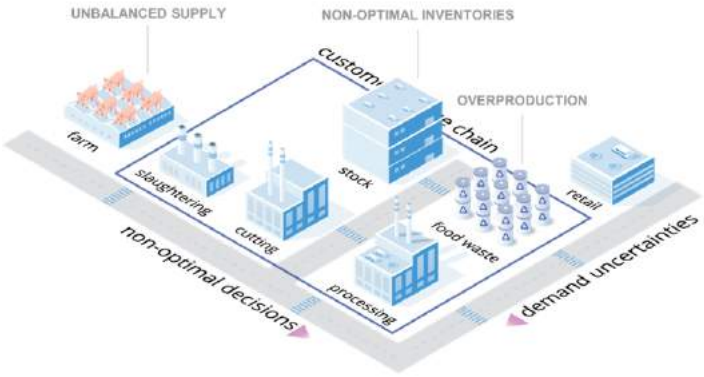
OPTIMAL DECISION-MAKING

Ensuring optimal utilization of resources and effective processes through the value chain is a continuous challenge – from slaughtering the optimal number of animals to assigning the right carcasses to the products, executing the right production cuttings, processing recipes, and manufacturing plans to deliver market demand.

The meat value chain is extremely complex, with trillions of possible sorting, cutting, and processing combinations to evaluate. Because of the immense complexity, creating an optimal plan hasn't been humanly possible.

The result: low margins, ineffective production, overstocking of materials, food waste, and using more animals than required to satisfy demand.

To be able to satisfy the demand for finished goods while maximizing profits throughout the value chain, it is crucial to utilize resources optimally. To do so, three main challenges need to be addressed.



01 | VALUE CHAIN COMPLEXITY

The value chain is a constantly moving set of gears, where isolated decisions have both upstream and downstream consequences.

With variables and parameters creating trillions of possible combinations at any point in time, it is crucial to have a system that can comprehend the complexity with a clear understanding and visibility of the consequences.

02 | UNCERTAIN DEMAND AND SUPPLY

Forecasts are always uncertain, and inaccuracies enormously impact production effectiveness and profitability.

At the same time, the value chain is constantly changing based on supply, demand, and production possibilities, creating a high risk of building up an undesired stock of raw materials and finished products when satisfying customer demand.

03 | NON-OPTIMAL DECISIONS

Finding the correct quantity of animals and how to optimally utilize them through cutting and processing, based on company constraints, business rules, supply of animals and market demand. Making optimal value chain decisions that have a positive impact on production costs, demand satisfaction, inventory levels and profit margins.

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Limits to current methods

Currently, most meat processors are using one (or a combination) of these approaches to make cutting decisions in daily production planning:

1. Excel
2. Off-the-shelf production planning software
3. Bespoke planning software

01 | EXCEL

Excel is the most successful and widely used business intelligence software ever created.

However, its ability to incorporate data from various source systems needed for a full overview is a major constraint to optimizing production planning. Additionally, even if data were to be extracted, prepared, and delivered into Excel, the vast amounts of computer power needed to run through the various scenarios to reach the optimal plan would push the computing power of any system.

To be able to run through the calculations requires computing power only available through cloud computing. While Excel can be used to create simple production schedules, it lacks many of the features necessary for more complex manufacturing operations.

On the other hand, production planning software is specifically designed for manufacturing environments and offers a range of tools to streamline production planning and execution.

02 | OFF-THE-SHELF SOLUTIONS

Production planning software goes a step further than Excel by helping to pull insight based on inventories, previous production plans, and orders that need to be fulfilled. Software like Quintiq from Dassault Systems does this quite well.

However, systems like these also have significant limitations in discovering optimal production plans. For example, they fail to provide visibility into yields, prices, freight rates, etc., greatly impacting meat processors' profitability.

Additionally, there is a limit to insights that can be gained from industry-agnostic solutions. Since the meat industry is unique in terms of the kinds of constraints and rules that producers are under, it can't be expected that general planning software would be able to account for these.

A planning software solution tailored to the meat industry's specific needs is better equipped to handle the industry's intricacies and help ensure that production is set to satisfy demand while optimizing production.



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03 | ERP SYSTEMS

While creating a custom software solution may seem appealing, it often comes with high costs and risks. On the other hand, purchasing a SaaS product offers many benefits, including cost savings, scalability, and ease of use.

Firstly, the cost of developing bespoke software can be prohibitively high, requiring a dedicated team of developers to design and build the software from scratch. In addition to the initial development costs, companies must bear the ongoing costs of maintaining and updating the software.

In contrast, SaaS products are typically priced on a subscription basis, allowing companies to access the software they need at a fraction of the cost.

SaaS products also offer a predictable cost structure, as companies can budget for the subscription fees and avoid unexpected expenses associated with custom software development.

Moreover, SaaS products offer greater scalability and flexibility compared to bespoke software. As a company grows and its needs change, it can switch to a different SaaS product to better meet its evolving needs. This eliminates the need to invest in expensive upgrades or redesign software from scratch.

Additionally, SaaS products are typically easier to use and require less technical expertise than bespoke software, making it accessible to a broader range of users within the company. Overall, the benefits of SaaS products make them a more attractive option for companies looking to streamline their software solutions without breaking the bank.

Comparison categories	Meat industry optimization	Off-the-shelf solutions	Bespoke planning ERP systems
Highlighted companies	VÖLUR	DELMIA Quintiq, C	infor, CSB-SYSTEM
Overview	Offers AI-driven solutions for meat producers to optimize carcass value.	Have significant limitations in discovering optimal production plans.	Production planning requires industrial knowledge.
Production planning	+	+	+
AI to maximize carcass value	+	−	−
Meat industry data knowledge	+	±	±
Optimal sorting and cutting plans	+	−	−

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Our Approach

Analytics is essential for decision-making, and more Advanced Analytics and Artificial Intelligence tools and techniques are required as competitiveness and performance pressure increase. These tools support decisions at any given stage throughout the value chain and at any given time.

Völur's process to provide this support begins by **exploring and exploiting existing customer data**, an essential asset and the main foundation for the rest of the components in this hierarchy. Information can be extracted by iterating with the data to identify how materials and processes are interconnected.

This information can then be transformed into **business and process knowledge and the customer's know-how**. Völur combines this process, represents it, and transfers it to the customer through insights and wisdom.

This methodology is essential to identifying and isolating problems, formulating hypotheses, and extracting understanding. All to help meat processors **make the right decisions at any given stage in the value chain** and to create beneficial outcomes from optimal decision-making.

DATA QUALITY ASSESSMENT

Völur AI solution is a standalone solution in the Azure cloud that is fed with the existing customer data, which might be stored in different data warehouses or even regions. Examples of this data are historical records and forecasts of supply and demand, cutting patterns, processing recipes, and inventory levels (to name a few). These data sources get streamed into our solution as often as the customer requires. Each data source has its own cleaning pipeline to ensure that it complies with requirements in data quality.

BUSINESS RULES, KNOW-HOW AND A GOAL-DRIVEN STRATEGY

The business rules currently applied throughout the value chain are extracted from the data, and know-how is transferred from key personnel to be represented in the models.

These rules are always driven by constraints, such as the quality reduction of meat when a product is frozen, the possibility to use organic products in non-organic recipes assuming the margin loss, or prioritizing special customer orders.

The strategy for the planning is goal-driven and tailored to the customer's needs, for example, to maximize profit while increasing weight. This strategy must satisfy policies to deliver the demand for products while optimally managing inventories and production plans.

SIMULATION & MODELLING

The service builds an accurate representation of the value chain and uses the latest available data to provide optimal planning automatically. Users can then modify parameters and simulate different scenarios while visualizing the consequences through the value chain.

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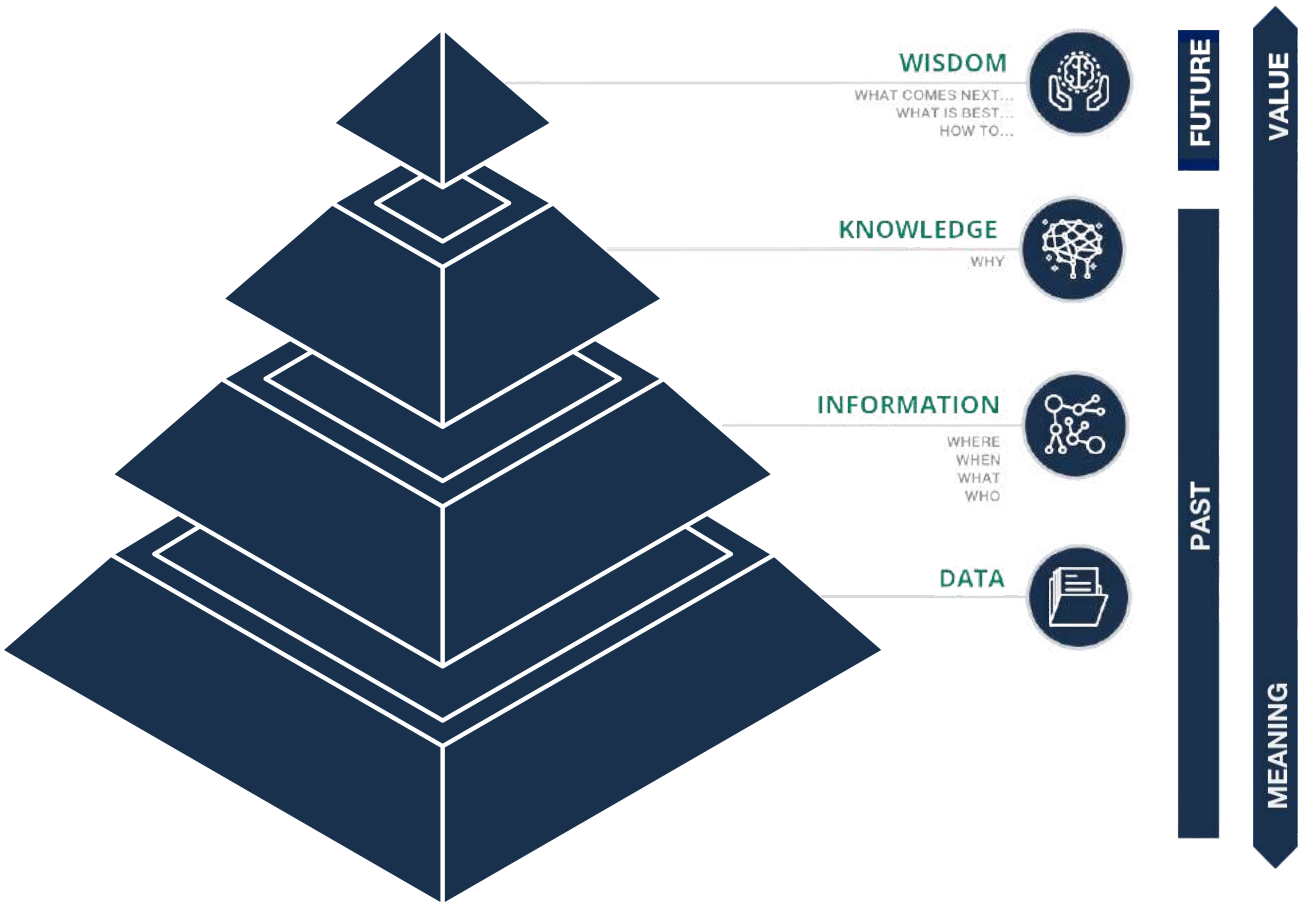
KEY TECHNOLOGIES

We use artificial intelligence to optimize the meat value chain.

The process begins by exploring and exploiting the customer's data. From there, we extract information by iterating with the data to identify how materials and processes are interconnected.

This information is contextualized into business and process knowledge, and Völur presents it to the customer with insights and recommendations.

We initialize the problem with a heuristic algorithm that follows business rules while a convex solver finds an optimal policy that satisfies the optimization constraints.



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Völur Solution

This section specifically looks at the daily production planning system developed by Völur to examine the requirements for an optimal daily plan that the customer executes.

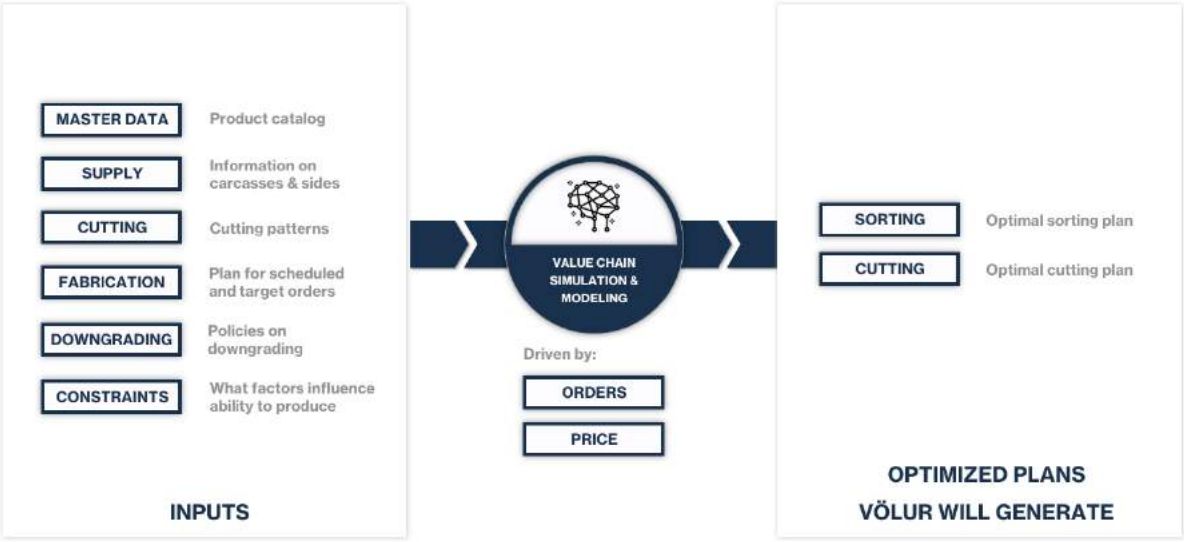
Combining the customer's own data and know-how with Völur's domain knowledge and state-of-the-art data science and modeling, Völur is uniquely positioned to create value for its customers along the meat value chain.

Solutions are available across five areas: Supply, Cutting, Processing, Inventory, and Sales.

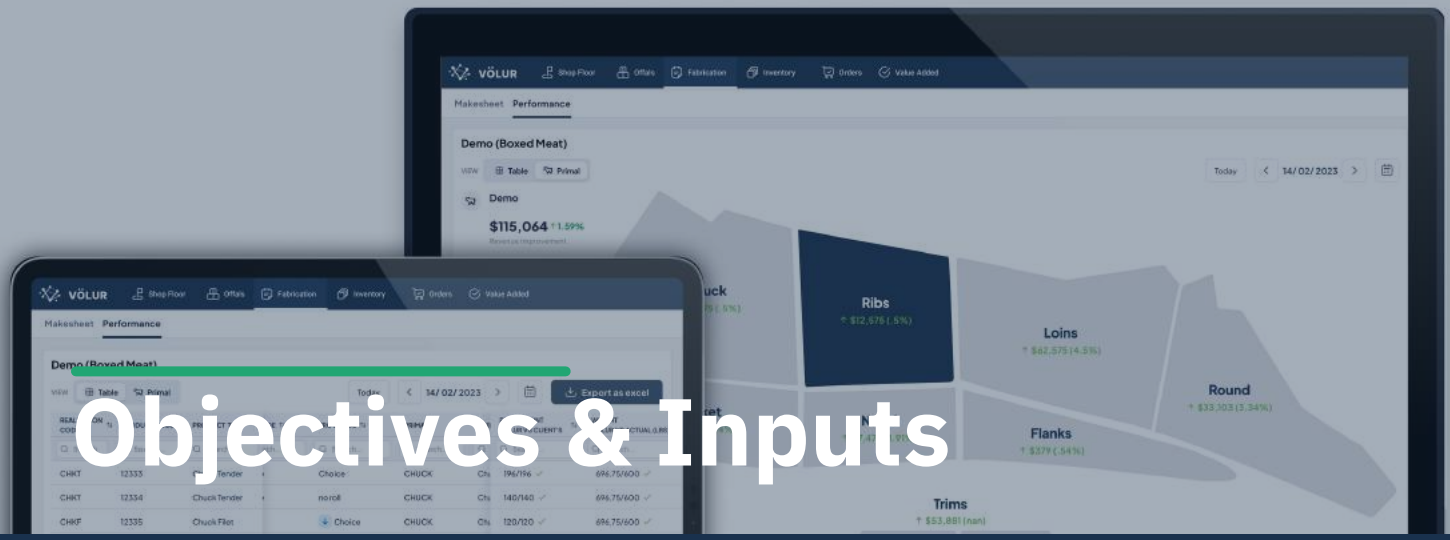
This document **focuses on sorting and cutting,** which is key to unlocking value in the other areas and generates significant value for processors.

Customers of Völur need a tool to generate an optimized plan for sorting and cutting of carcasses on (at least) a daily basis.

That scheduling should be automatically generated from the data on the carcasses coming into production, sales orders, and pricing levels while considering the different decisions and choices related to cuttings and fabrication.



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Objectives & Inputs

OBJECTIVES

The objective of the Völur system is to generate a plan that enables customers to:

- Establish **data streams** to feed the model for the automatic generation of fabrication plans and schedules for daily operations.
- **Generate a daily fabrication plan** for a fixed position of carcasses into cuttings.
- Generate a daily fabrication plan **with an optimal automatic sorting of carcasses** into cuttings (according to the main features of the carcasses).
- Identify **the increase in value** and compare optimization vs. non-optimization.
- Identify **the main primals and cutting patterns** that drive the most improvement.
- Identify the characteristics of the carcasses that are **helpful in increasing revenue.**

Additionally, the plan should:

- Be **accurate** within the different business rules and constraints throughout the value chain, both at tactical and operational levels.
- Be **understandable and correct** for the given scope.
- Be **actionable** by the schedulers, planners, and operators on the production floors.
- Be **comparable** to the customer's plans whenever available.
- Be **secure** within the customer's security requirements and industry standards.

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INPUTS

The data, data streams, business rules, and constraints defined and established must answer the following questions:

CARCASSES

- What are the different carcasses and sides available for the production day?
- What is the number of carcasses and sides graded in the coolers?
- What are the grades, brands, yield class, and weight for the carcasses and the sides available?
- What are the downgrading rules for grades and brands?





ORDERS

- What are the target orders for the fabrication day?
- What are the policies on shorting or not delivering orders?
- What is the prioritization of orders and customers?





KNOW-HOW

- What are the business goals the model should be optimized for?
- What are the business rules in place that must be fulfilled? (For example, when can downgrading take place?)
- What are the constraints around production that must be navigated? For example, what is the amount of space in the cooler for sorting carcasses going into production?

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Redefining the status quo

By combining meat industry knowledge and cutting-edge AI, Völur has created software **to get maximum value from each animal** that enters the slaughterhouse.

In a perfect world, meat processors could match the right carcass with the right final product while completely satisfying all orders. The reality is a lot more complex, and teams today do their best to plan daily production using know-how and software like Excel to find a good balance between supply and demand.

But that means not capturing significant carcass value since they aren't fully accounting for the valuable data they already collect. In our experience, that can mean several percentage points in margin and **tens of millions of dollars in unrealized value.**

LEVERAGING DATA FOR VALUE

Völur's platform capitalizes on the industry's existing data, seamlessly integrating data from various ERP systems, data warehouses, Excel spreadsheets, and know-how. By transforming raw data into valuable insights, we **unlock untapped potential in fabrication.**

ADVANCED INSIGHTS FOR INFORMED DECISIONS

Through rigorous data quality assessment and contextualization processes, we ensure the accuracy and depth of the insights generated. These insights empower planners to navigate complexities confidently, **fostering decision-making that drives operational excellence.**

Employing state-of-the-art AI and machine learning methodologies, we model complex industry challenges to uncover significant value for our customers in the meat industry.

	OVERALL	COLD STORAGE	CUTTING	PROCESSING
Traditional meat producers & packers	Decisions made with Excel and *know-how*	Limited sorting of carcasses	Non-optimal Cutting decisions	Non-optimal Processing decision
	Lower margins and suboptimal levels			
VÖLUR	Decisions made with data, AI & *know-how*	More profitable sorting of carcasses	Improved cutting decisions & schedules	Improved use of raw materials in processing
	Increased margins and profit			

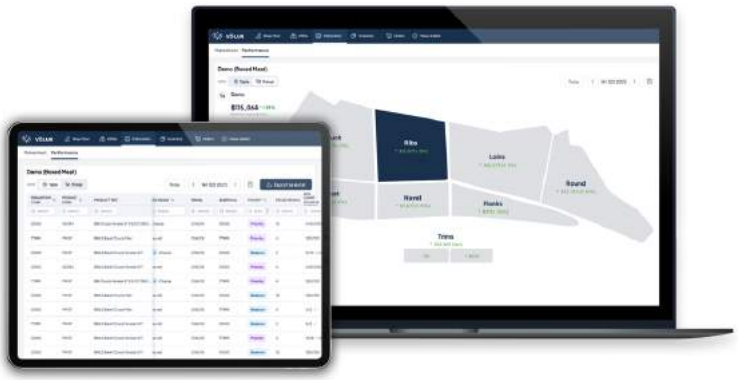
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Realizing Operational Value

The result is an **optimal daily production plan** tailored to the customer's business goals, rules, and constraints based on data from throughout the value chain. This plan, or makesheet, is delivered to the team on the fabrication floor to execute – just as it is done today.

The difference is that **this plan is optimized to generate more value.**



$45M Increased income in one factory	**3%** Increased carcass value
5% Increased Demand Satisfaction	**$20M** Reduced Inventory levels
25M$_{kg}$ Reduced Carbon Footprint	**9.8%** Improved utilization of animals

Völur's optimal daily cutting plan also provides insight to others in the organization on **the available carcasses going into production** that day and the **value generated** using a Völur plan versus the previous way of planning.

IMPACT

Value creation through better utilization of animals and available cuts. Customers have reported **5% increased sales** due to better-met demand and **3% increased revenue** by weight because of optimized production planning through Völur.

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Maximizing carcass value with AI

Learn more at **volur.ai**

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