

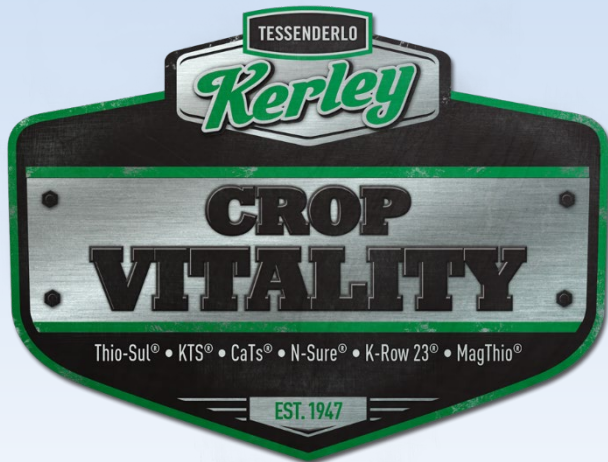
Tessenderlo Group

Tessenderlo Group is a diversified industrial group that focuses on **agriculture**, **valorizing bio-residuals** and providing **industrial solutions**.

Founded and headquartered in 1919 in Belgium

- +4,500 employees
- +100 locations across 21 countries
- +1.7 billion EUR revenue in 2017
- Listed on Euronext Brussels





Crop Vitality is the world's largest and leading producer of sulphur-based liquid plant nutrition products to the agriculture industry. The family of Crop Vitality sulphur-based liquid fertilizers, soil amendments and nitrogen stabilizers help crops reach their maximum potential while using fertilizers, water and other resources more efficiently. Crop Vitality is part of the Agro segment of Tessengerlo Group.

**Mission: Nurturing and enhancing
life through innovative chemistry**



Fertilizer Basics

What is Fertilizer?

Substance aiding plant growth: an organic or synthetic substance usually added to or spread onto soil to increase its ability to support plant growth

Synonyms: [manure](#), [compost](#), [nourishment](#), enricher, [top dressing](#), [peat](#)



Fertilizer Basics

16 Elements Necessary for Plants

Carbon (C)	Calcium (Ca)
Hydrogen (H)	Boron (B)
Oxygen (O)	Chlorine (Cl)
Nitrogen (N)	Copper (Cu)
Phosphorus (P)	Iron (Fe)
Potassium (K)	Manganese (Mn)
Sulfur (S)	Molybdenum (Mo)
Magnesium (Mg)	Zinc (Zn)



Crop Vitality Product Lines

- **THIO-SUL[®]** (ATS) = 12-0-0-**26S**
- **KTS[®]** = 0-0-25-**17S**
- **CaTs[®]** = 0-0-0-**10S**-6Ca
- **N-Sure[®]** = 28-0-0 Slow Release Nitrogen
- **MagThio[®]** = 0-0-0-**10S** – 4Mg
- **K-Row 23[®]** = 0-0-23-**8S**



Crop Vitality Operation



Crop Vitality Storage Tanks



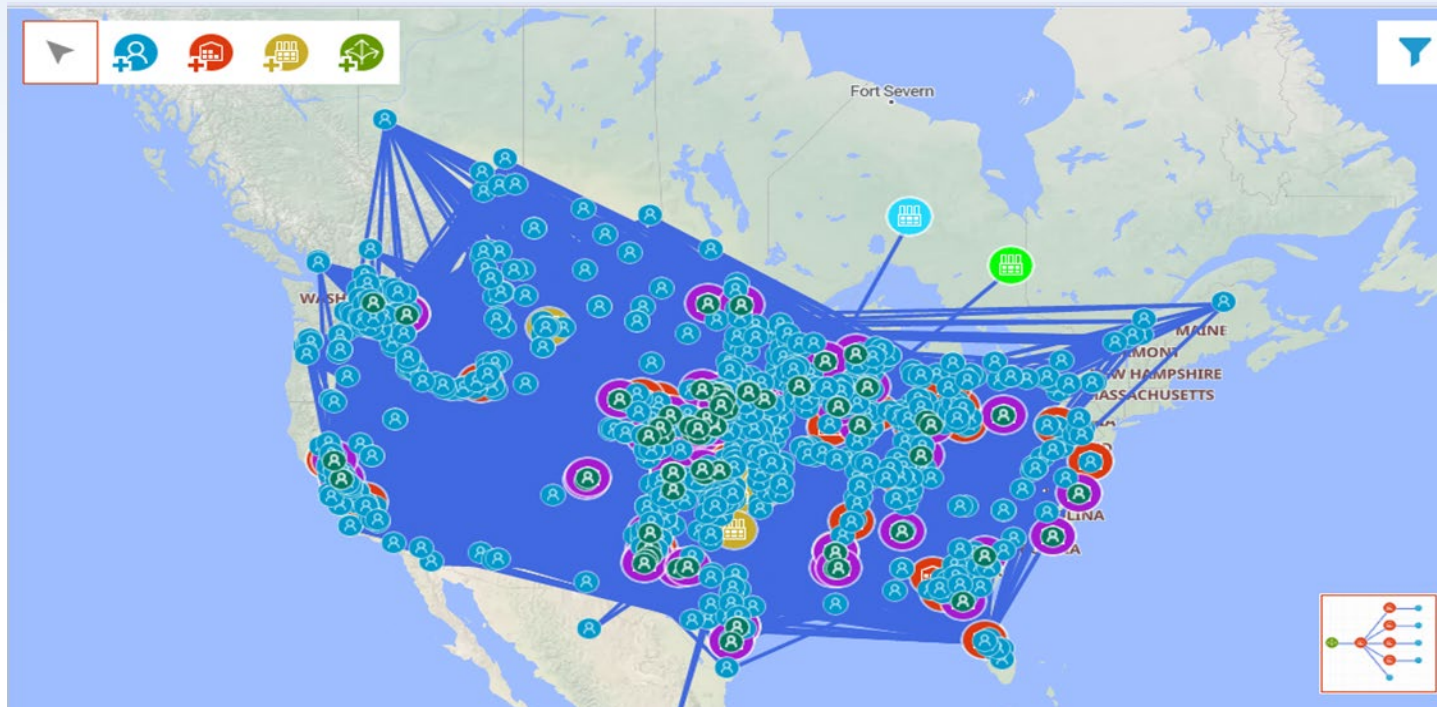
Crop Vitality Distribution



Supply Network Optimization

Objective:

- **Determine the “optimal” strategy to stock and distribute materials within the North American TKI supply chain network**



Supply Network Optimization

Key Input Data Elements and Assumptions

- **Predicted future demand volumes**
- **Production costs by product & plant**
- **Freight cost by lane & mode**
- **Distribution Terminal operating (throughput) costs**
- **Storage Capacity at each terminal & plant**
- **Production constraints (minimum & maximum throughput) by plant**
- **Item master data (finished goods and raw materials)**
- **Rail loading capacities by location**
- **Customer constraints**



Supply Network Optimization

Key Model Features

- **1 year time horizon modeled**
- **12 monthly planning periods**
- **Represented planned plant shut downs through reduced throughput constraints (i.e. 500 tons in Jan vs. 10000 tons in Feb)**
- **Constrained customer source options depending on existing contractual obligation**



Supply Network Optimization

Result of Analysis:

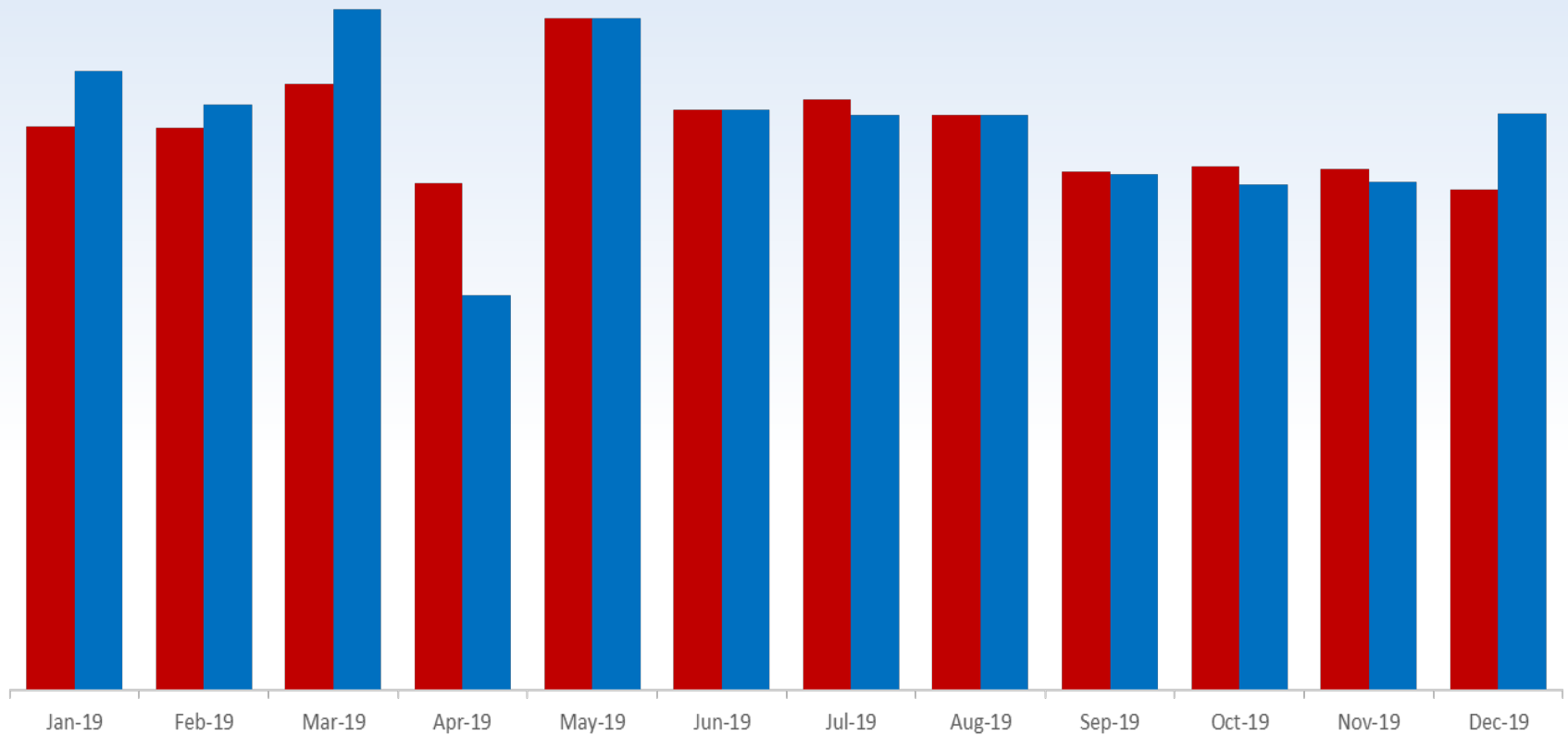
- Freight lane cost, manufacturing cost, storage cost..etc (before vs. after). i.e. we saved x dollars across our network in transportation spend while maintaining fulfillment expectations
- New modes leveraged across the supply chain (i.e. from rail to barge)
- Articulate changes in storage/inventory across the network



Supply Network Optimization

Production Plan

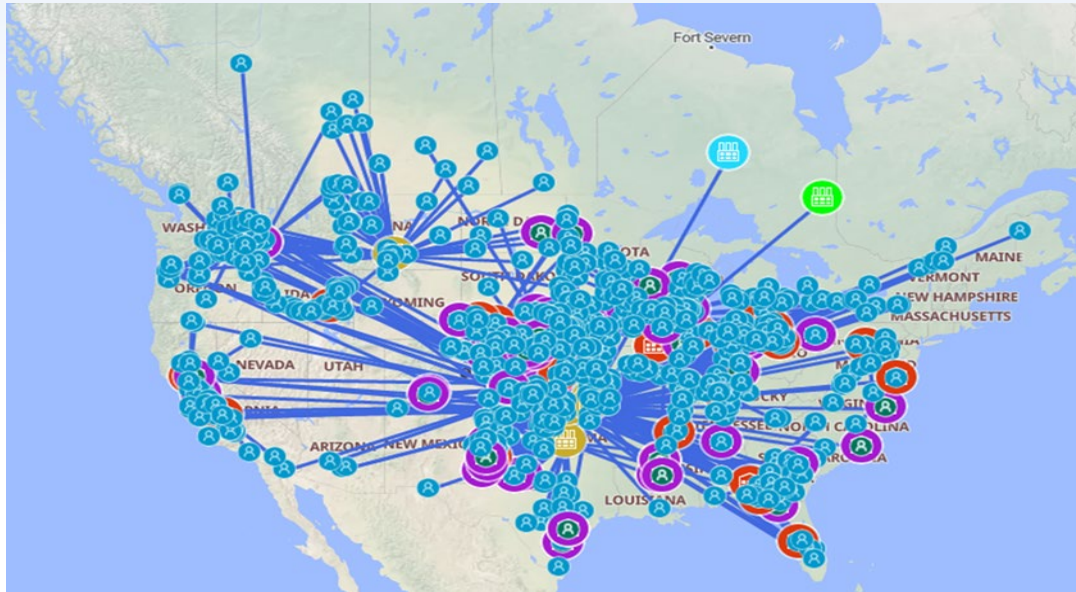
■ Original 2019 Budget ■ Billings Down April 2019



Supply Network Optimization

Future Opportunities:

- Look at expanding plant capacity in certain regions
- Opportunity cost
- Specifics on cost to serve customers
- Expansion of product lines



Thank You

