



BoMill Single Kernel Sorting
IAOM, Texhoma District Meeting – July 26, 2019



BoMill *NIR Single Kernel* Sorting

- Introduction (Bratney Companies and BoMill)
- BoMill Basics (how it works)
- Models (IQ and TriQ)
- Applications
- Installations
- Development Programs
- Bratney Companies – Brief Overview

BRATNEY COMPANIES

Equipment sales, process design, and construction for agricultural processing

Locations

Des Moines, Iowa (headquarters)

Boise, Idaho

Kansas City, MO

Fargo, North Dakota

Sacramento, CA

Colon, Argentina



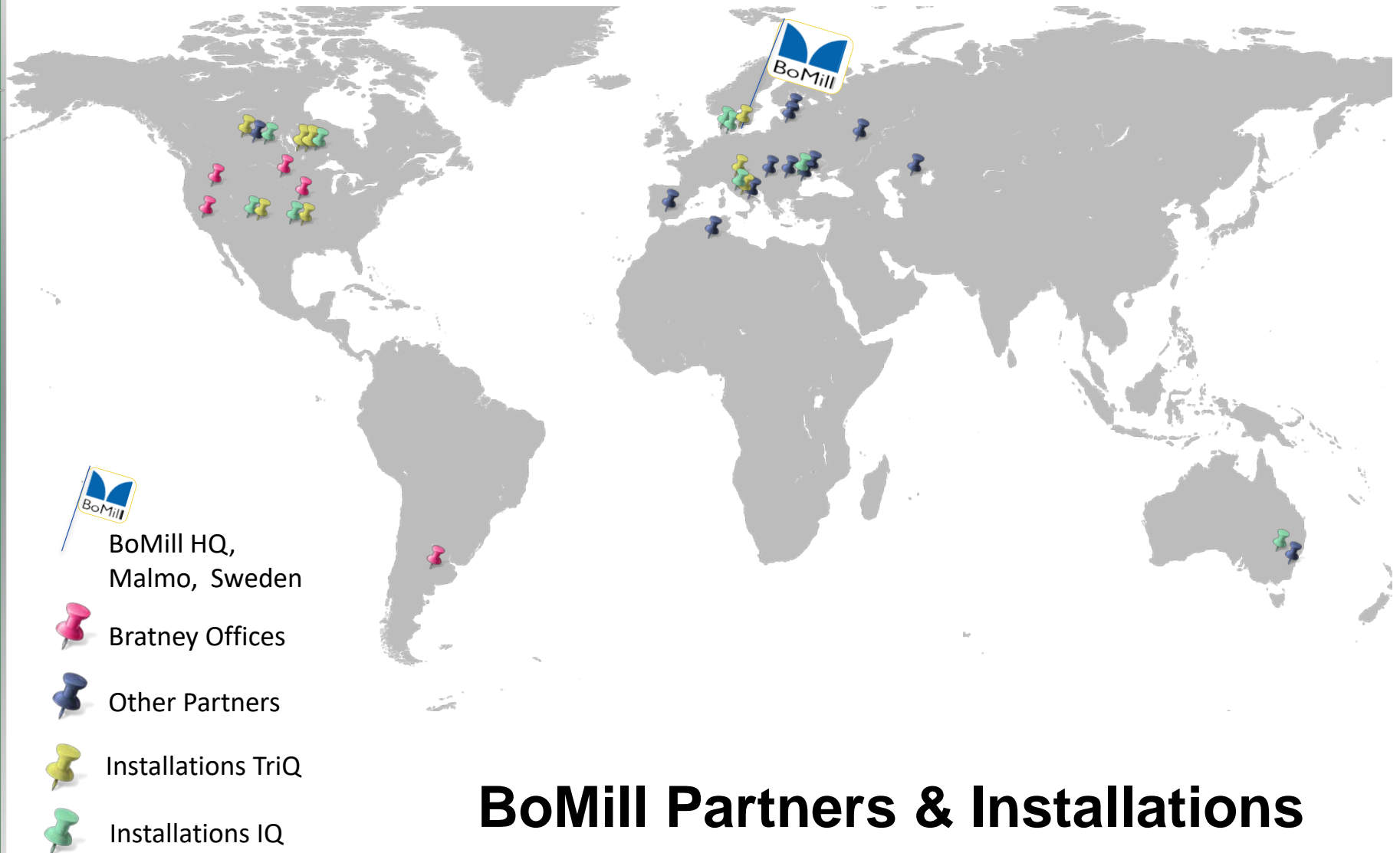
Revenue

80 – 100+ MM USD

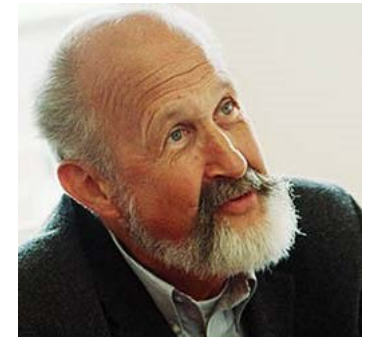
Employees

120 – 150

Construction crews and service technicians in several locations in US



BoMill Company Profile

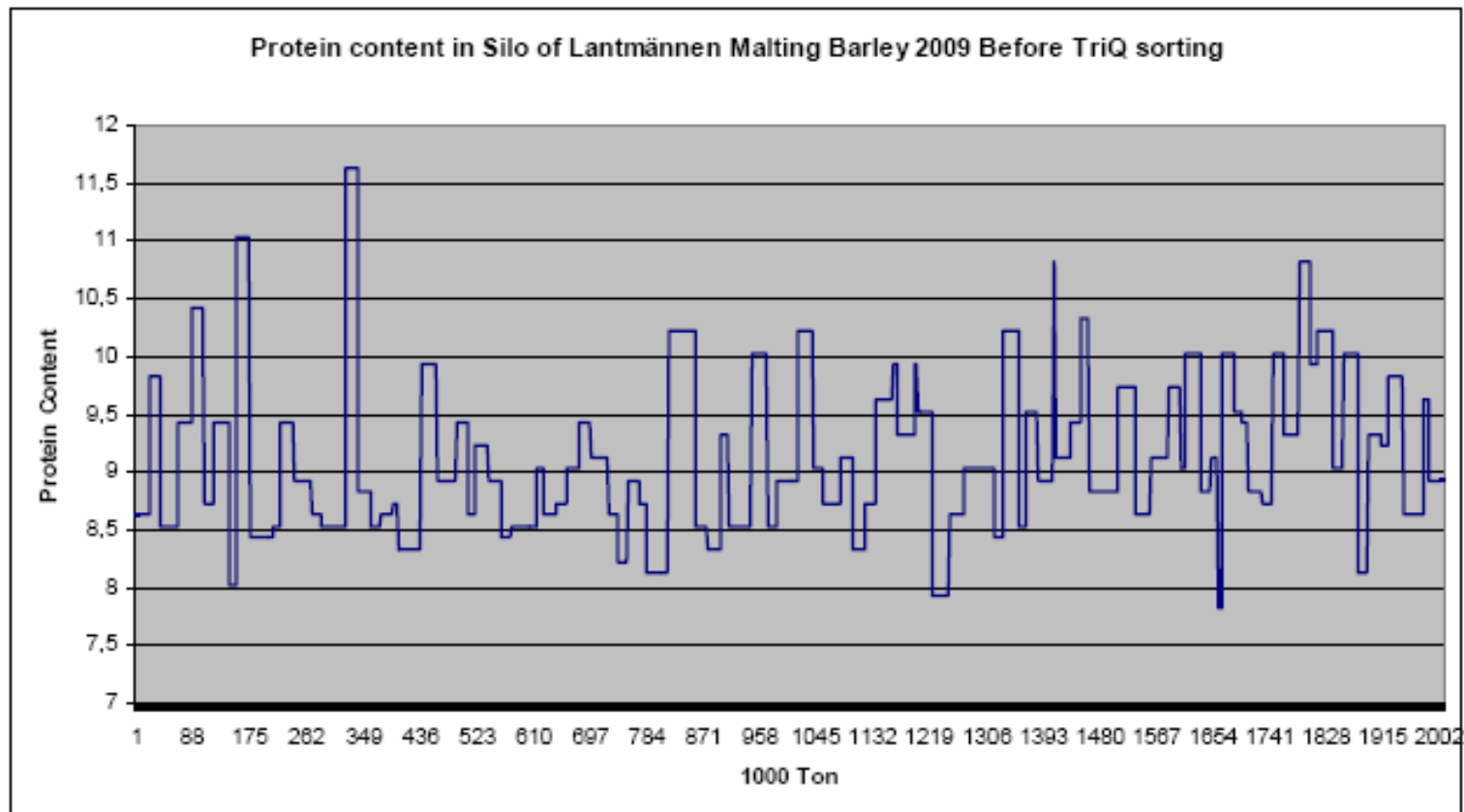


Bo Löfqvist

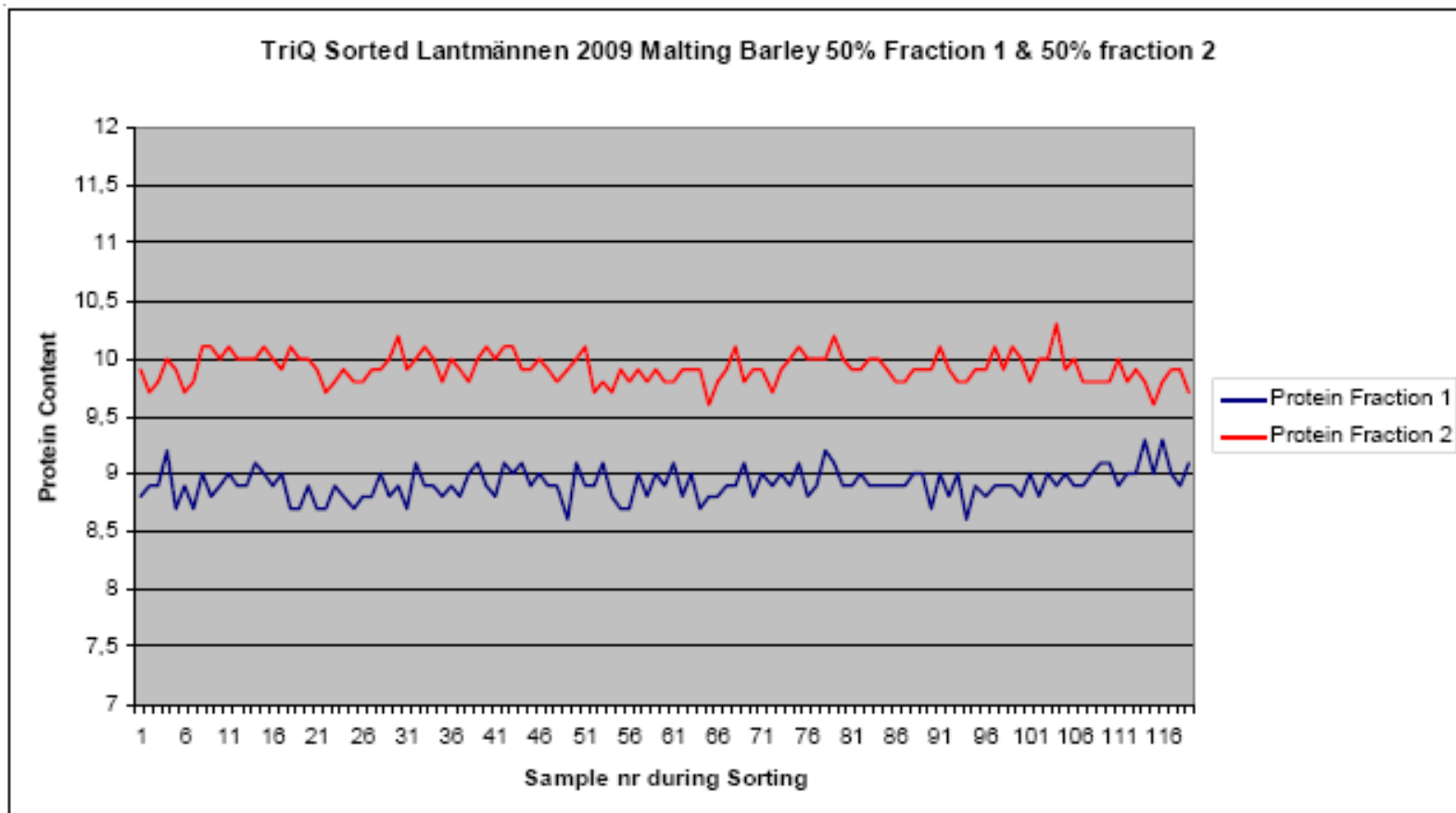
- Headquarter in Malmo, Sweden
- Development and sales of **near infrared (NIR) transmission** grain sorting machines with industrial throughput capacity
- Founded in 1998 by **Bo Löfqvist**, PhD Bio Chemistry
– CEO Karin Wehlin since 2012
- Bo Lofqvist was a cereal chemist with Carlsberg Brewery
- Recognized the value in **single kernel NIR sorting** to create homogenous protein lots of barley prior to malting process
 - Consistent water uptake into the kernel results in uniform sprouting
 - High Efficiency Production; Higher Quality Malt
- Also recognized that minimizing DON in barley to non-detectable levels produced the best malt and best beer
- With the development of high-speed micro-processors, single-kernel NIR sorting became a possibility
- Global patents granted for key technologies



Variation of Protein in Barley delivered to Malt Plant



Protein variation after BoMill Tri-Q sorting into two fractions





Flour Milling



Semolina Milling



Malting / Distilling



Animal Feed Milling



Seed Germination



Grain Marketing

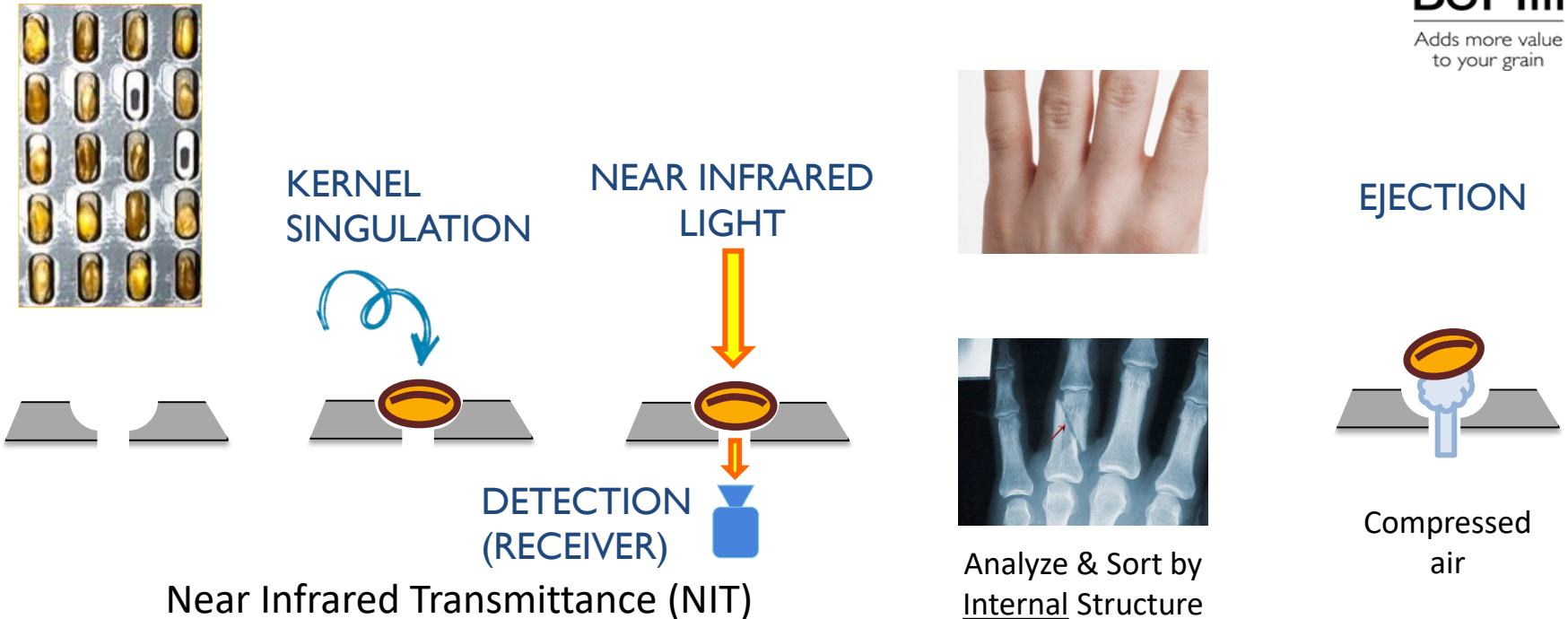


Producer / Farmer



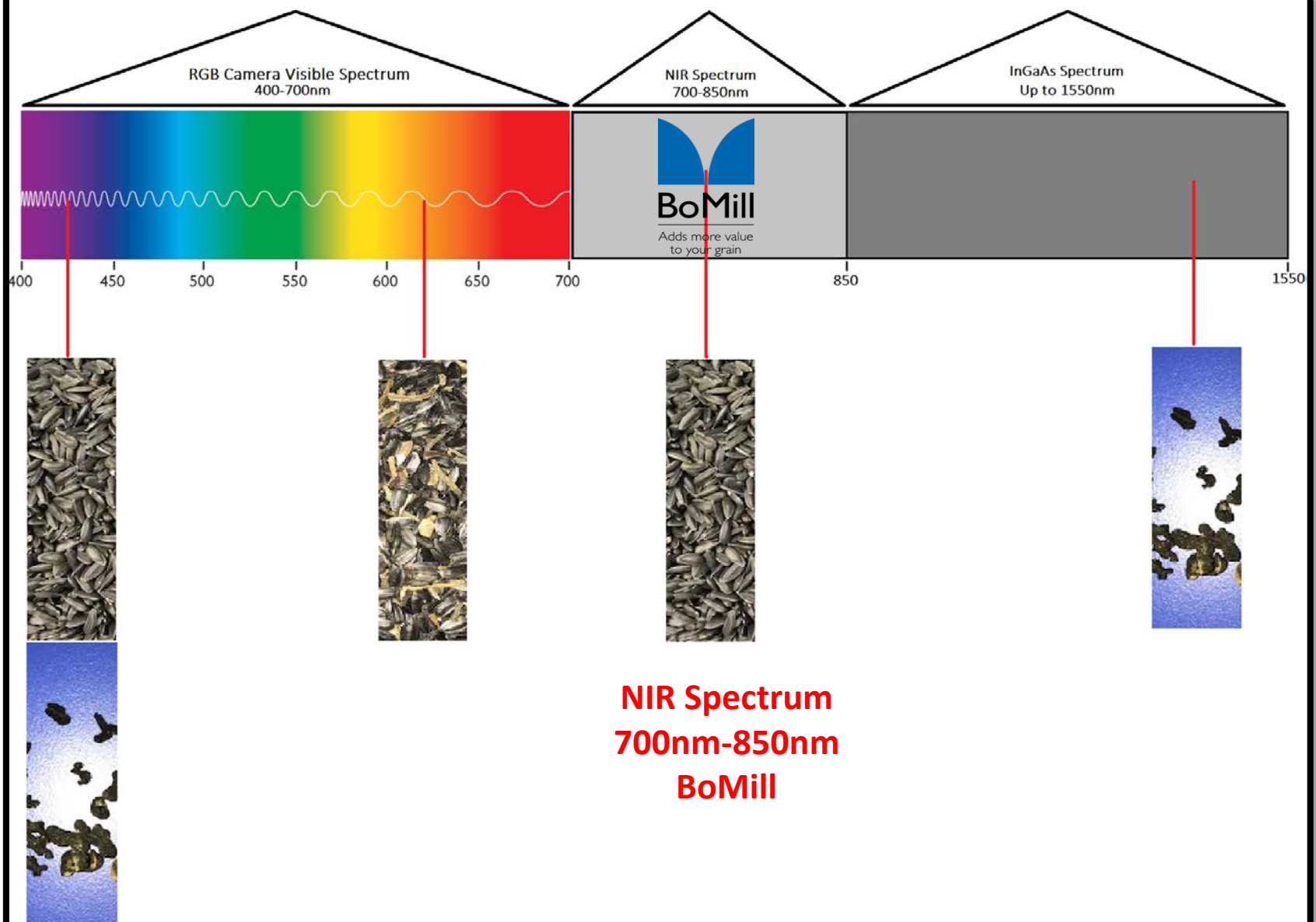
Organic Grain

SINGLE-KERNEL SORTING PRINCIPLES



Sort **Barley, Wheat, and Durum** by **Internal** Properties:

- Relative **Protein** Content
- Kernel **Hardness** (vitreous qualities)
- **Vomitoxin** (DON / Fusarium / Other Mycotoxins)





Adds more value
to your grain

BoMill – **NIR** Single-Kernel Sorting Equipment



Model IQ Lab Unit

- 5 Pounds/Hour
- 6 Quality Fractions



Model Tri-Q Production Unit

- Approx. 3 Metric Tons/Hour
- 3 Quality Fractions



BoMill IQ Lab Unit



Features

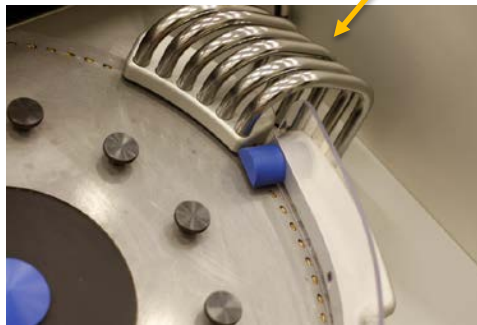
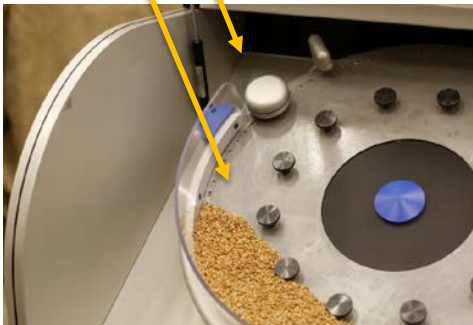
- Sorts Kernels of Wheat, Barley, & Oats by Protein, Hardness, Mycotoxins
- 5 Pounds/Hour
- 6 Quality Fractions

Rotating Singulator disk

NIR Transmitter/Receiver

Ejector Tubes (6)

Collection Jars (6)





BoMill

BOMILL MODEL IQ SORTING REPORT



Date: 2/6/2018

SAMPLE DETAILS

Grain: Hard Red Winter Wheat
Customer: _____
Sorting Parameter: Protein
Protein Reference: 12.5%
DON in Reference: 3.0ppm



Air/Screen
Cleaner

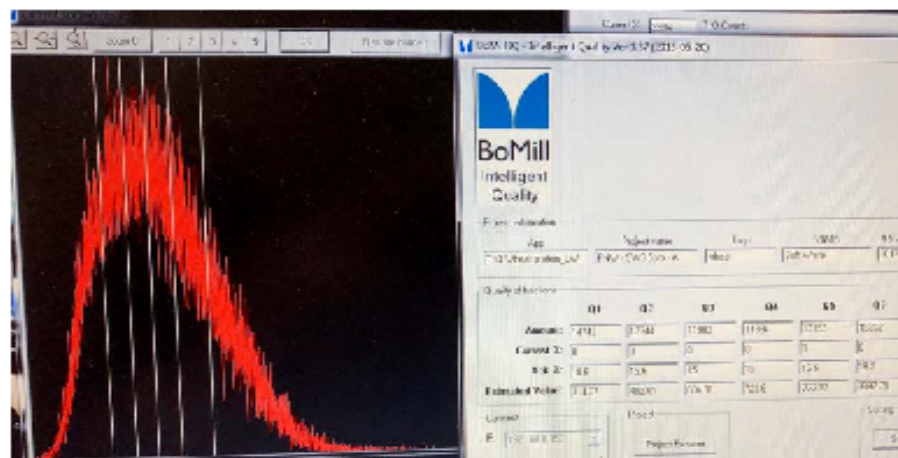
Incoming Grain (lbs): 7.54
Control Sample (lbs): 0
Sorted Sample (lbs): 7.54
Cleaning < 5.5/64 slot; > 12 Rd (lbs): 0.21
Cleaned Sample (lbs): 7.33



test sample



Fractions F1 - F6

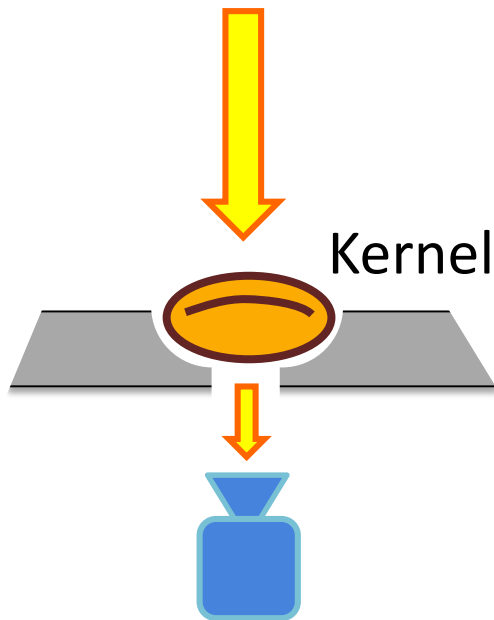


SORTED FRACTIONS

	F1	F2	F3	F4	F5	F6
Weight (lbs)	1.48	1.24	1.17	1.20	1.20	1.04
Yield (%)	20.2	16.9	16.0	16.4	16.4	14.2
Protein (%)	11.2	11.9	12.4	12.7	13.2	13.5
DON (ppm)	17.5	1.6	0.7	0.4	0.3	0.3
Germination (%)						

Basic Function of the **BoMill TriQ**

Near-infrared Light

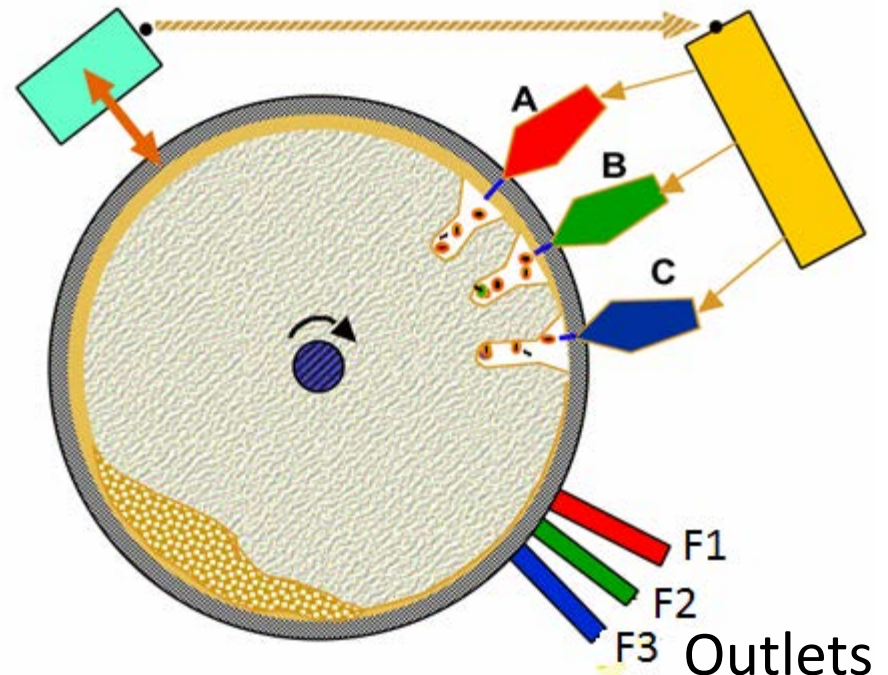


Receiver

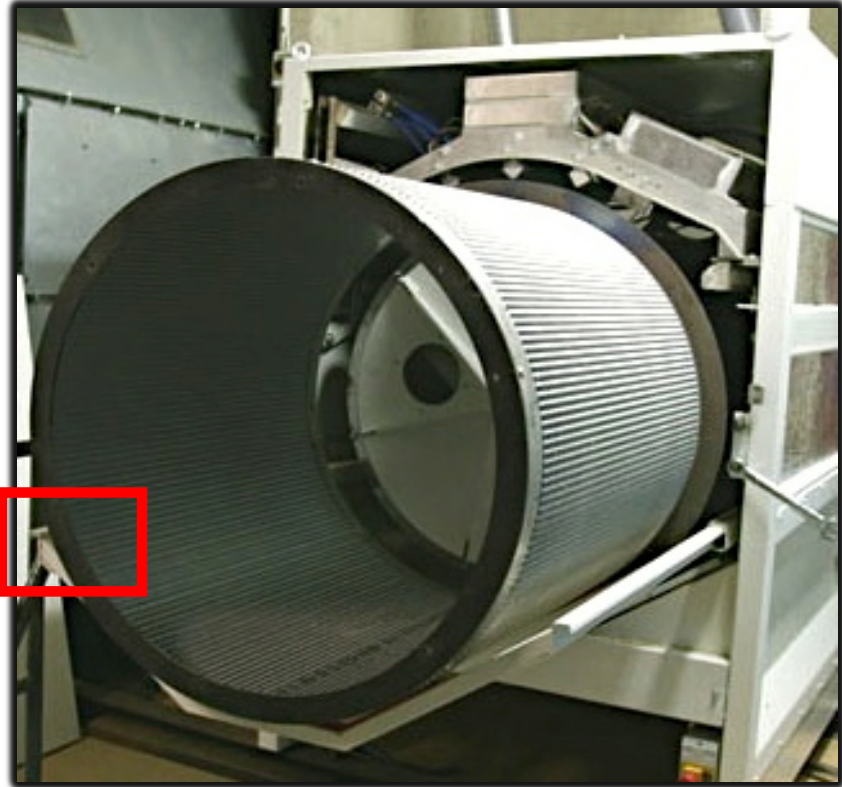
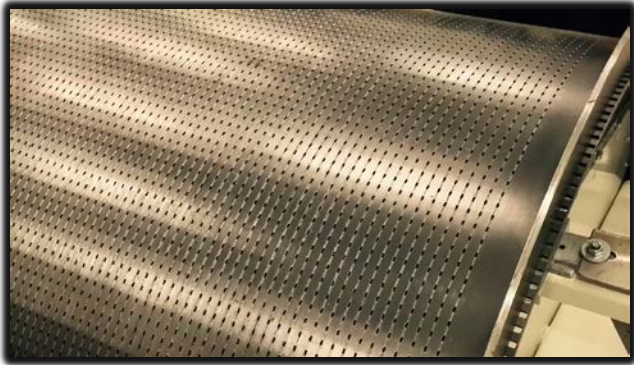
(10) measurements
per kernel

NIR Transmitter

Ejectors



BoMill TriQ – Kernel Singulation Cylinder



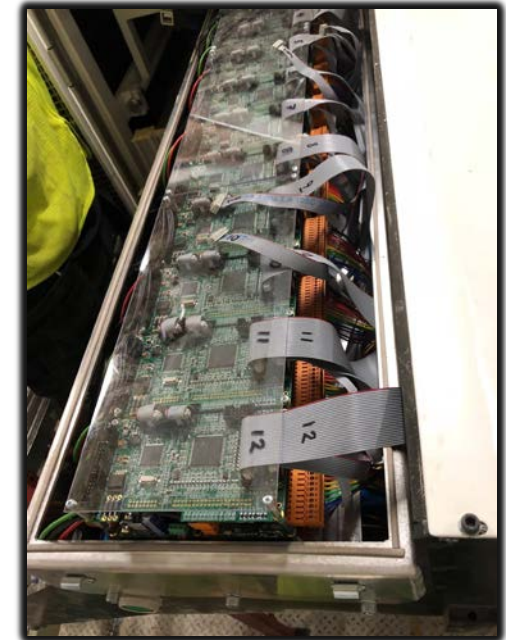
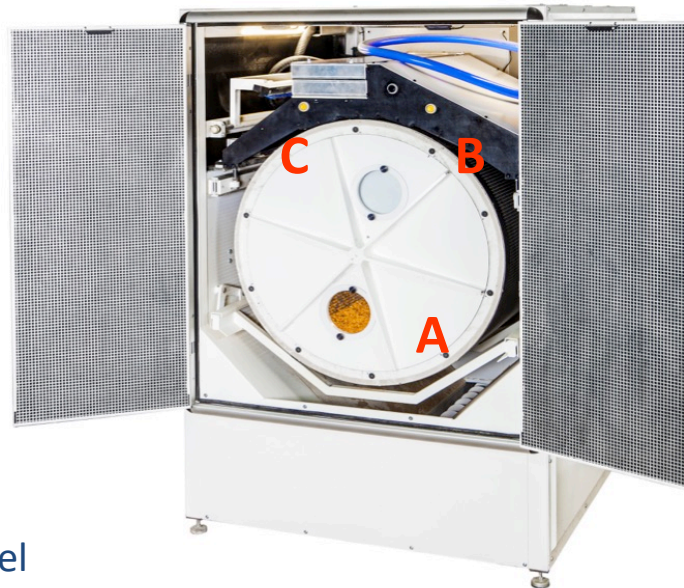
- Along length of the cylinder, there are **96** channels
- Around the circumference per channel, there are **260** pockets
- Total pockets per cylinder is **24,960**

Functionality of the TriQ30 sorter

A Positioning cylinder

B Detector system

C Ejection system



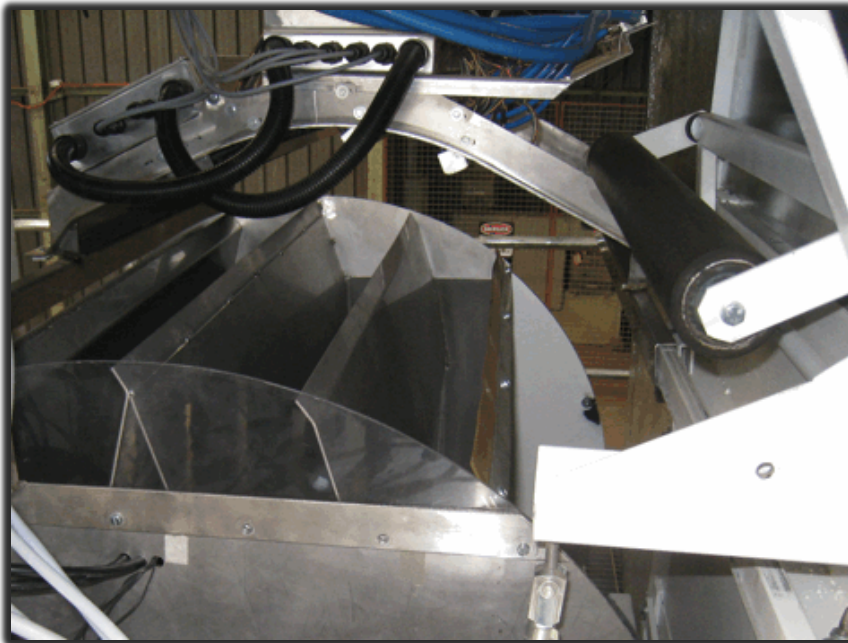
Micro-Processors

- Cylinder with 96 channels
- 260 pockets in each channel
- Cylinder rotates at 1 rev./sec. (60 RPM)
- Total capacity is approx 24,960 kernels/second
- Up to 10 measurements per kernel
 - Total up to **249,600 measurements/sec**
- Three ejectors per channel, one for each fraction
- Segregates into three (3) fractions





Basic Function of the BoMill TriQ – Sorting



Collection Troughs for 3 fractions
(Singulator Drum removed)



Outlets
(3) Sorted Fractions

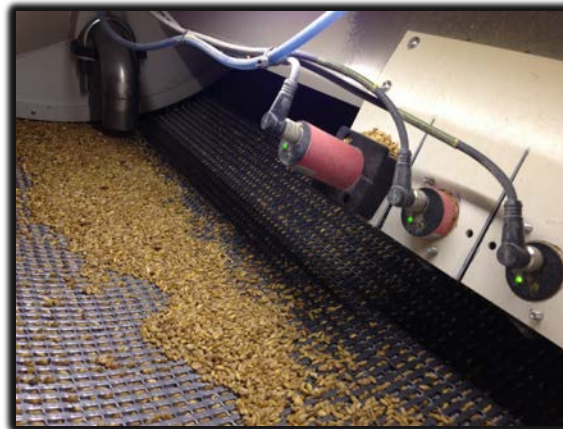
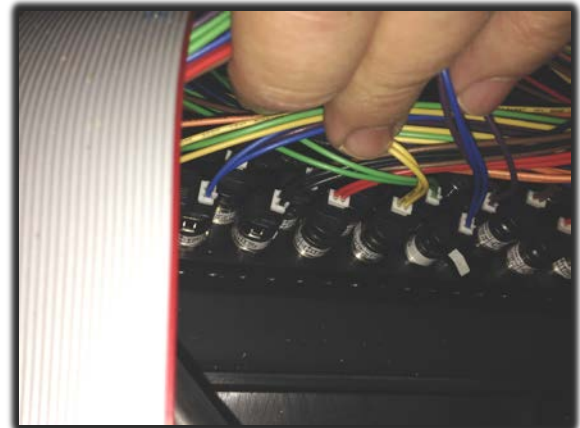
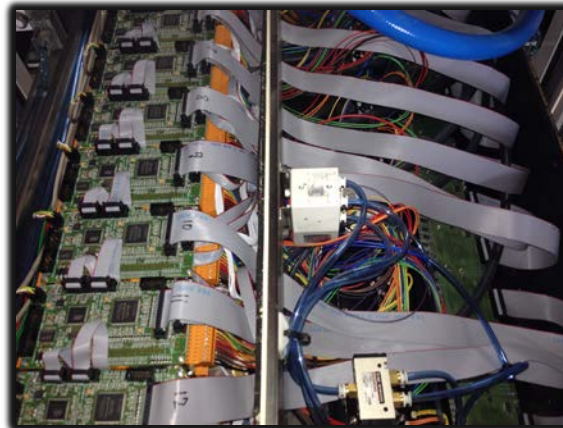


BoMill

Adds more value
to your grain

Model Tri-Q

Excellent Access to Key Components

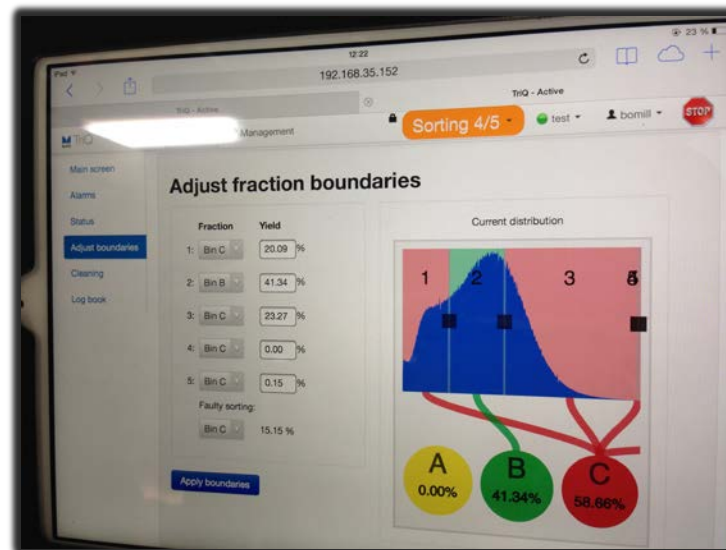
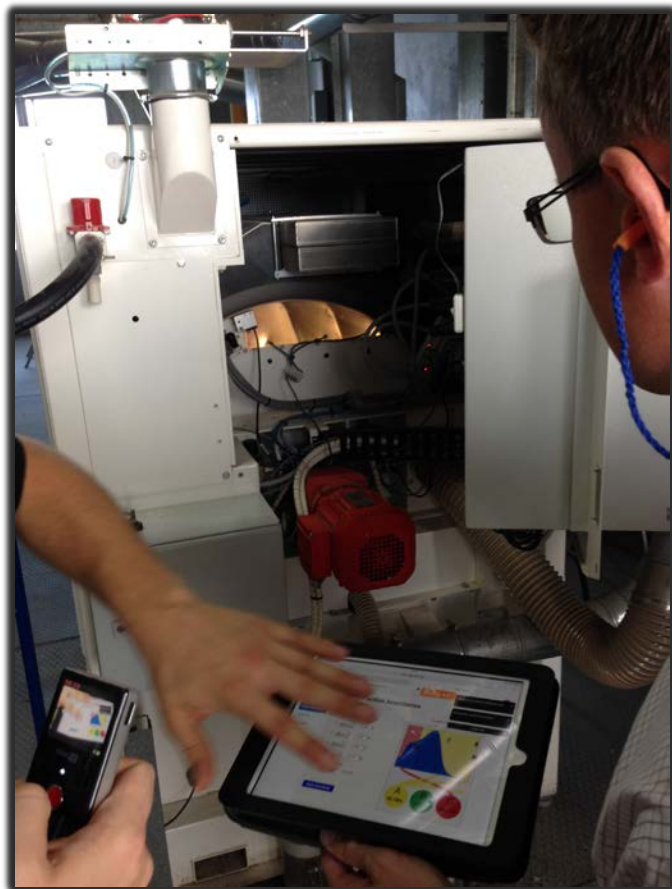




BoMill

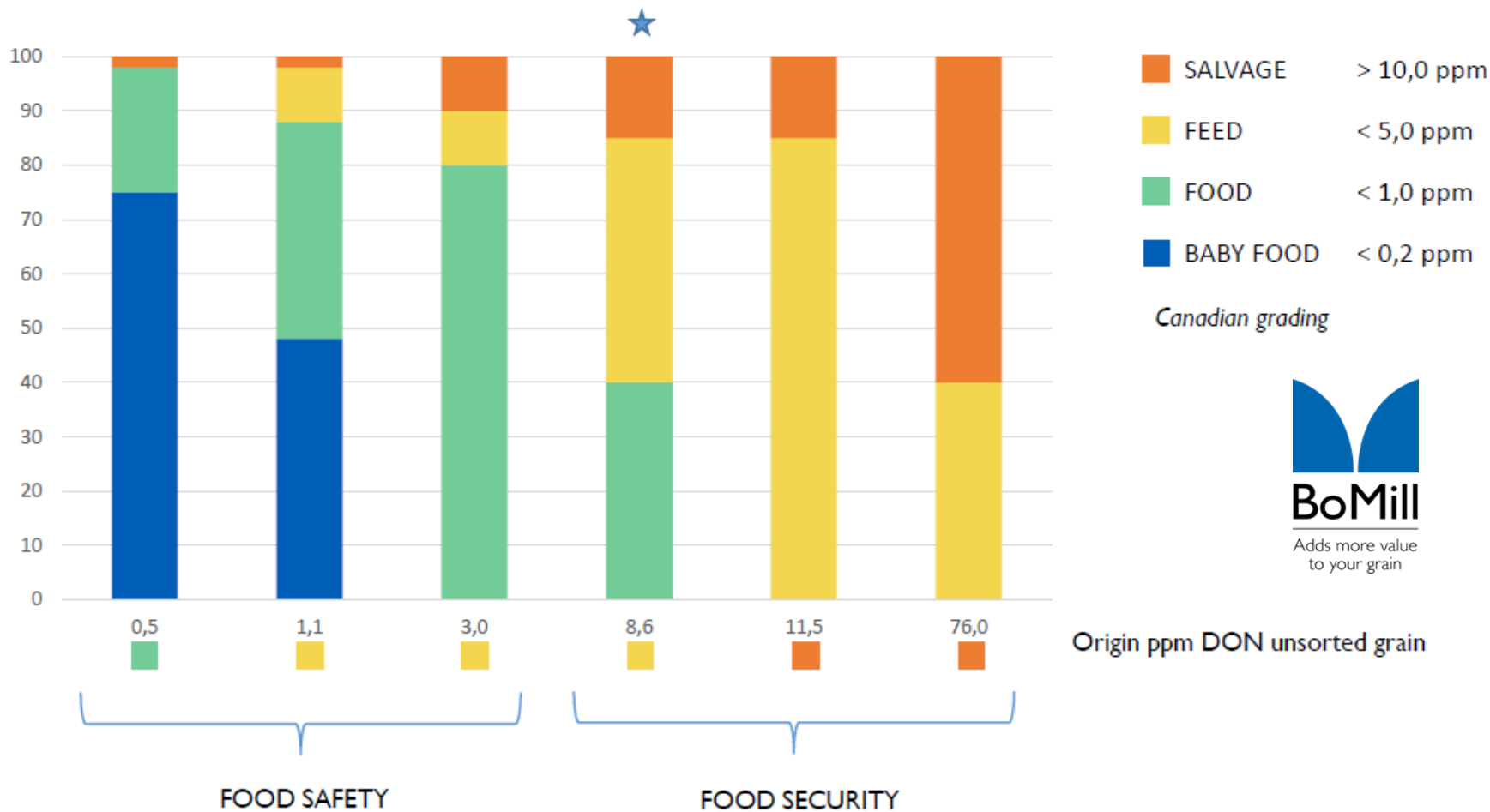
Adds more value
to your grain

Model Tri-Q Controls

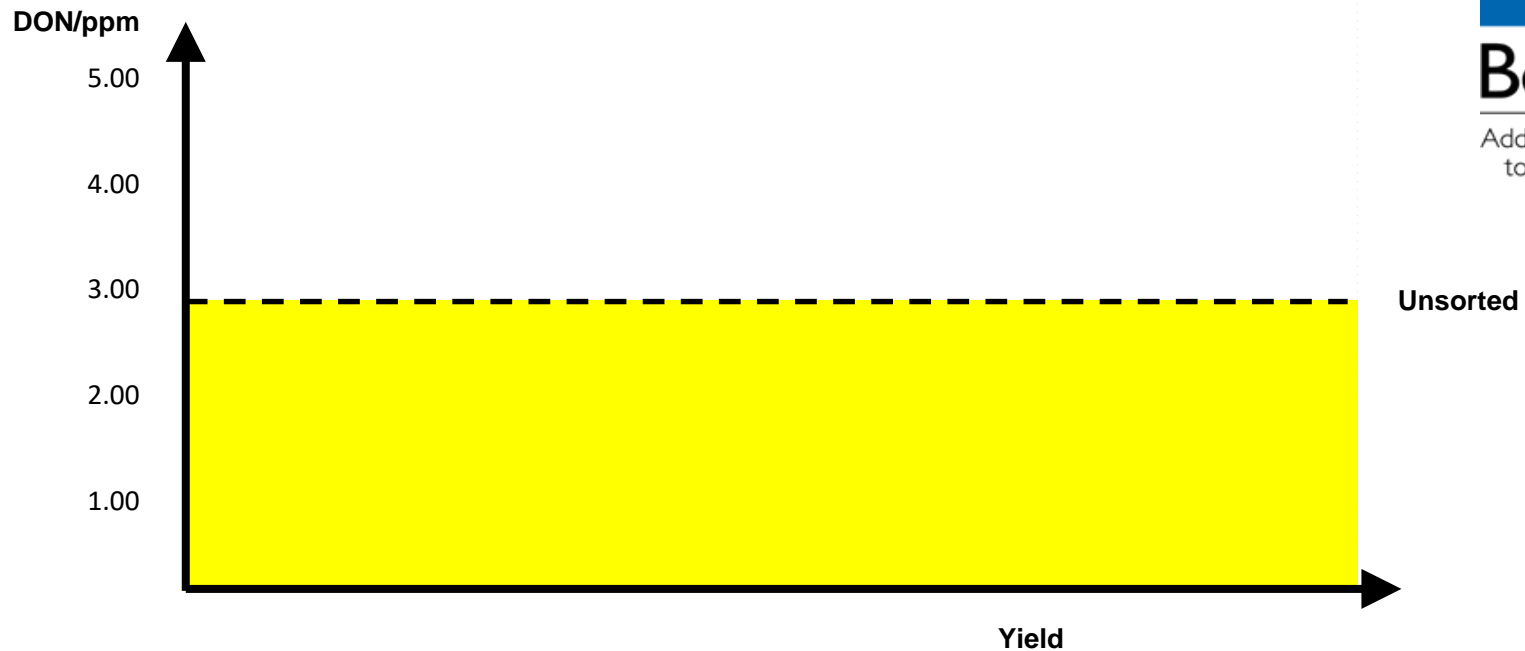


FOOD SAFETY - FOOD SECURITY

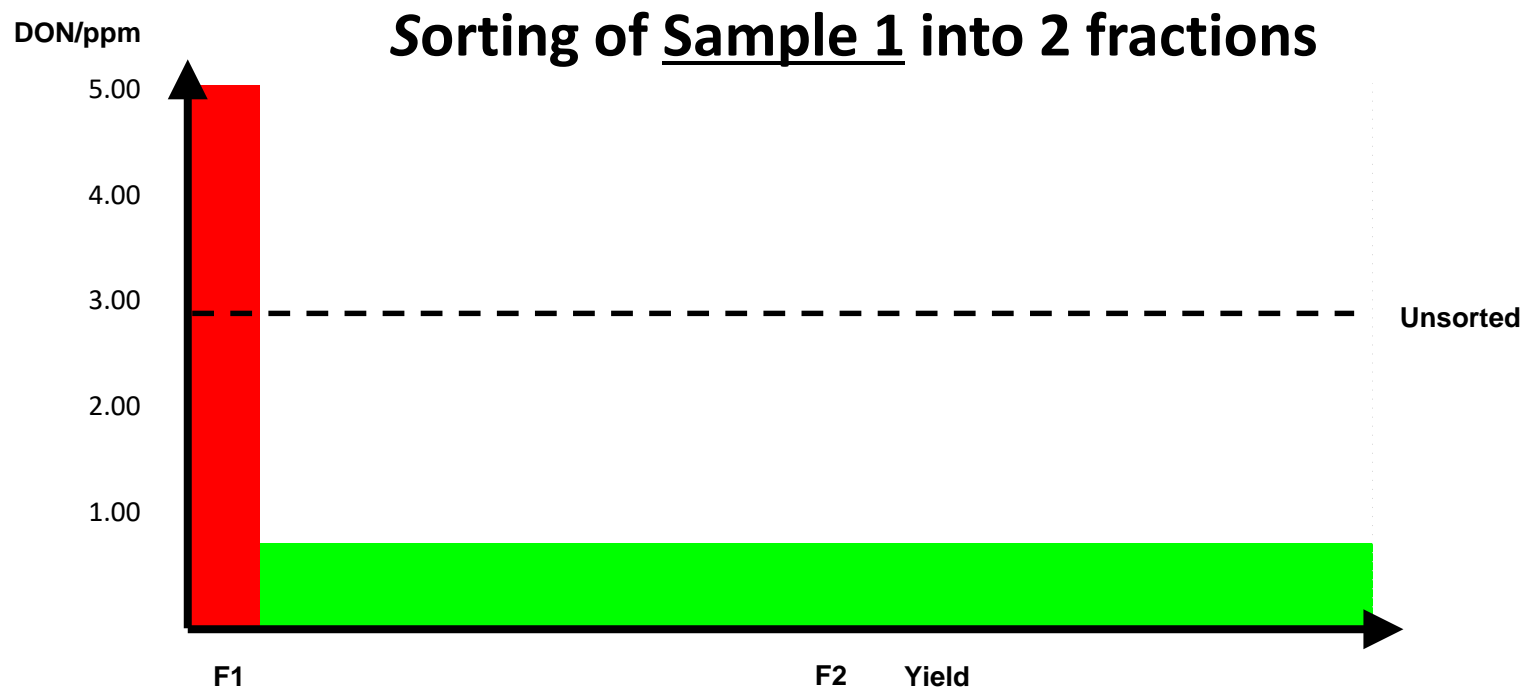
TYPICAL VOMITOXIN (DON) DISTRIBUTION IN GRAIN



Vomitoxin – Sample 1



Sample of wheat (HRS)	Unsorted
DON Yield	3.00 ppm 100%



Sample of wheat (Hard Red Spring)	Unsorted	Fraction 1	Fraction 2
DON Yield	3.00 ppm 100%	>12.00 ppm 6.5%	0.84 ppm 93.5%



BoMill

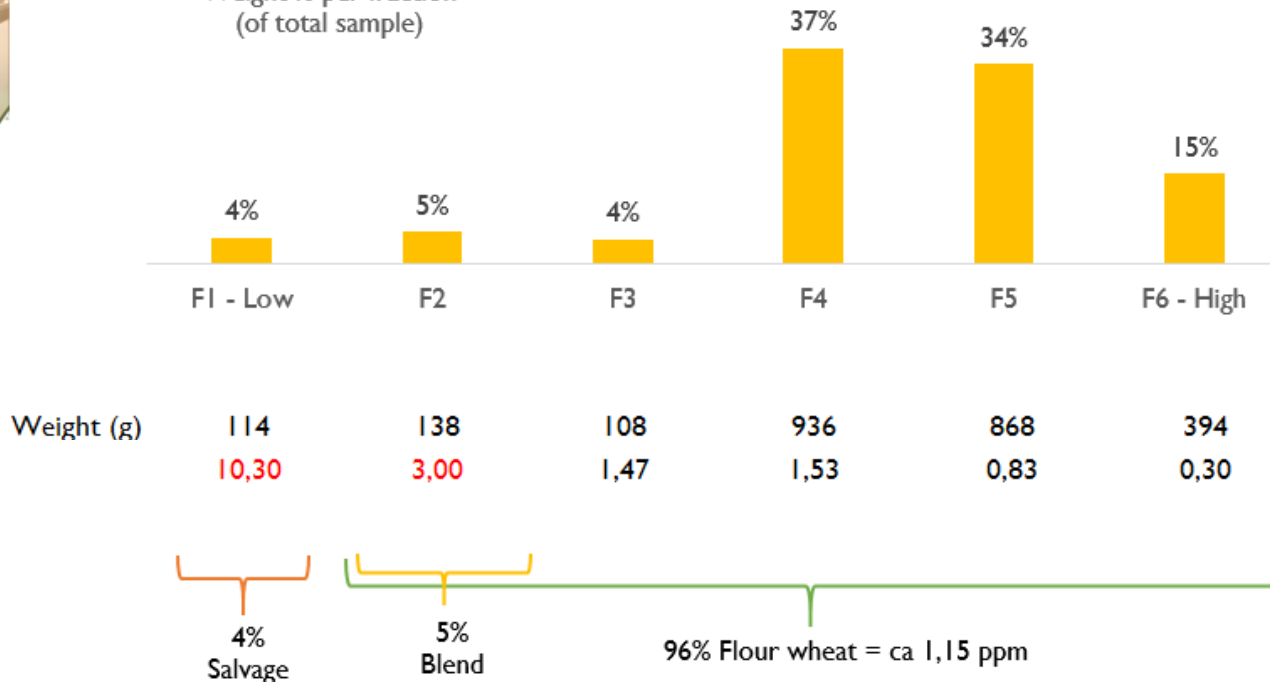
Adds more value
to your grain

SPRING WHEAT (3.0 ppm DON)

pre-screened at 5.5/64" or 2.2 mm



Weight % per fraction
(of total sample)

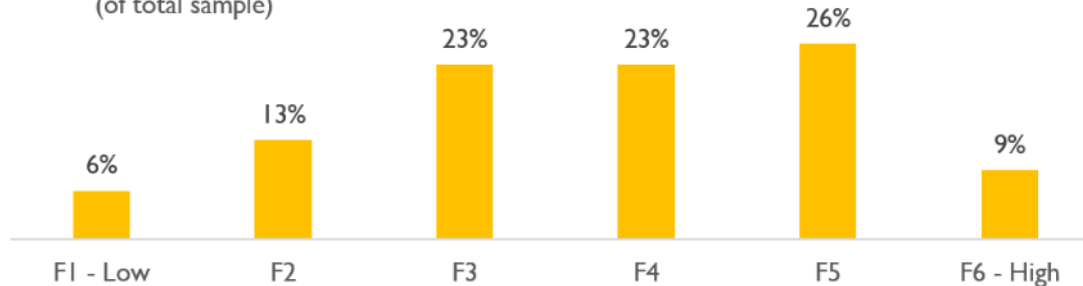


WINTER WHEAT (6.0 ppm DON)

pre-screened at 5.5/64" or 2.2 mm



Weight % per fraction
(of total sample)



Adds more value
to your grain

DON (ppm)	44.5	8.2	3.9	1.8	1.3	0.8
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Σ DON (ppm) **2.1 – 81% yield**

Σ DON (ppm) **1.4 – 58% yield**

ROI: Quality sorting of *vomitoxin* infested grain



		Original value
1,000,000 Bu 5 PPM DON wheat (\$2.50/Bu)		\$2,500,000
Fraction		Value after TriQ sorting
1	800,000 Bu 2 PPM DON wheat (\$4.50/Bu)	\$3,600,000
2	200,000 Bu +10 PPM DON wheat (\$1.50/Bu)	\$300,000
	Added gross value through TriQ30-sorting	\$1,400,000
	Operational cost (\$0.07/Bu) x 1.0M Bu	-\$70,000
	Adjusted added value (1.4M – 70K) / 1.0M Bu	\$1.33/Bu
	Investment 2 x TriQ30	-\$620,000
	Cleaning system, automation, and installation	<u>-\$500 000</u>
		-\$1,120,000

$$(\$1,120,000 / (\$1.33/\text{Bu})) / 220\text{Bu/hr} = 3,830 \text{ hrs}$$

Return on Investment (2,000hrs/yr)

1.9 Years

Protein Sorting Example – *Hard Red Spring Wheat*



Incoming HRS wheat at **14.7%** protein upgraded to **15.2%** protein by sorting out 25% of lowest protein fraction

BoMill Sorted Wheat Fractions by **Protein** & Resultant **Falling Numbers**

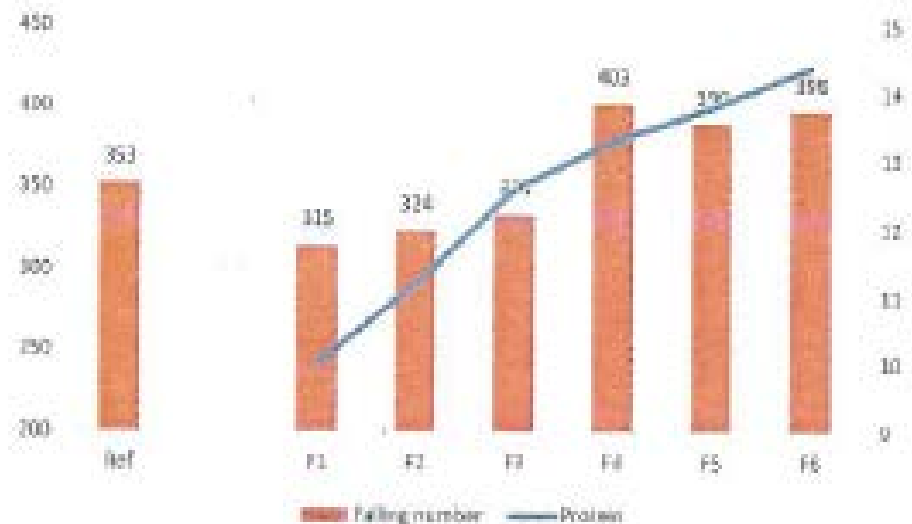
Create Uniform High Quality Wheat for milling superior flour to meet **consistent and repeatable** baking performance

Produce wheat with favorable Falling Number values not achievable through blending

FALLING NUMBER / PROTEIN

Customer X (Vitreousness sorting)

	Protein	Falling number	Germination
Ref	13	353	80
F1	10	315	84
F2	11.2	324	80
F3	12.6	334	86
F4	13.3	403	78
F5	13.8	390	84
F6	14.4	398	90





Organic Wheat



Organic **Seed** Production

- High Vitreous kernels resists plant diseases
- High Vitreous kernels provide best germination and strongest plants
- High Protein kernels result in high protein crop

Organic Wheat

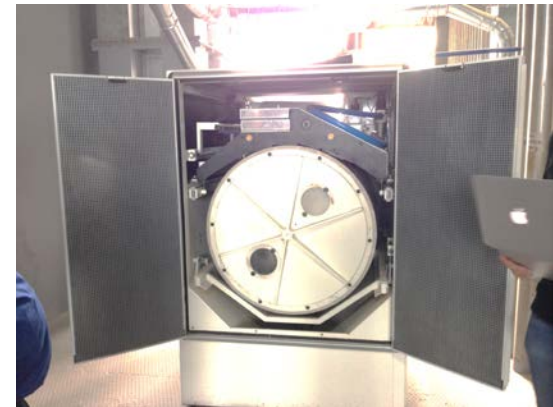
- Optimize Protein to take advantage market premiums
- Improve Falling Number
- Deliver uniform wheat for consistent milling performance

Canadian HRS Wheat **Seed** with 3.0 ppm DON (after air/screen cleaner and gravity table)

Result of sorting:						
Kernels per fraction (%)	10,5%	20,1%	19,0%	24,2%	18,0%	8,3%
	F1 - Low	F2	F3	F4	F5	F6 - High
Weight per fraction (gram)	107	204	193	246	183	84
Protein per fraction (%)	0,00	0,00	0,00	0,00	0,00	0,00
DON per fraction (ppm)	8,42	2,9	1,53	1,04	0,58	0,43
Gemination rate Original:		69%				
Gemination test (BoMill)	Fraction 1	Fraction 2	Fraction 3	Fraction 4	Fraction 5	Fraction 6
Geminated kernels	38	58	77	88	93	92
Non-Geminated kernels	62	42	23	12	7	8
Total kernels in sample	100	100	100	100	100	100
Gemination rate	38%	58%	77%	88%	93%	92%

DURUM GRAIN TERMINAL

One of the worlds leading Durum traders with 5 BoMill TriQs



SEMOLINA MILL: MOLINO CASILLO - ITALY

Some facts:

One of the worlds leading private semolina milling facilities with 3 mills



Grain elevator: Varaslättens lagerhus - SWEDEN

Site



Pre-design



Installed TriQ



Front

Back

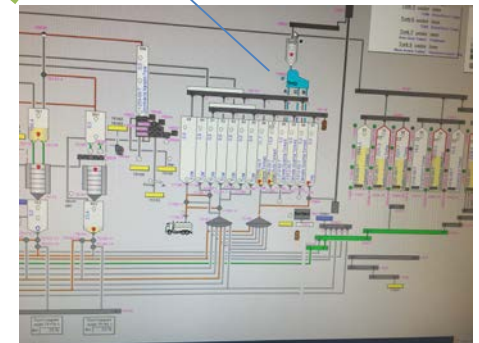


TriQ installed on the 7th floor

Automation

TriQ connected the customers main SCADA interface for remote control.

BoMill TriQ



SCADA: Supervisory control and data acquisition

Some facts:

Founded 1930 / Owned by 1,900 farmers in western Sweden / Grain storage 135,000 mt / Trades 250,000 mt annually

FEED MILL: Winnipeg, CANADA

DON/Vomitoxin sorting out of Barley and Durum





BoMill

Adds more value
to your grain

Grain Terminal Installation – USA

Designed, Engineered and Installed by Bratney

Ten (10) BoMill Tri-Qs preceded by ten (10) Cimbria Sizer Cylinders
DON/Vomitoxin and Protein Sorting

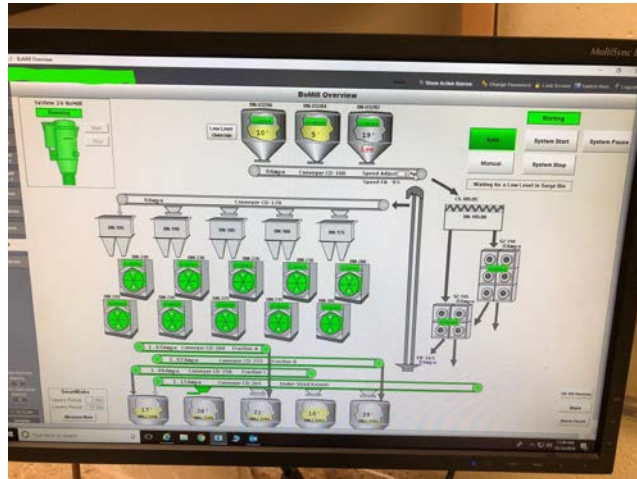


Grain Terminal Installation – USA

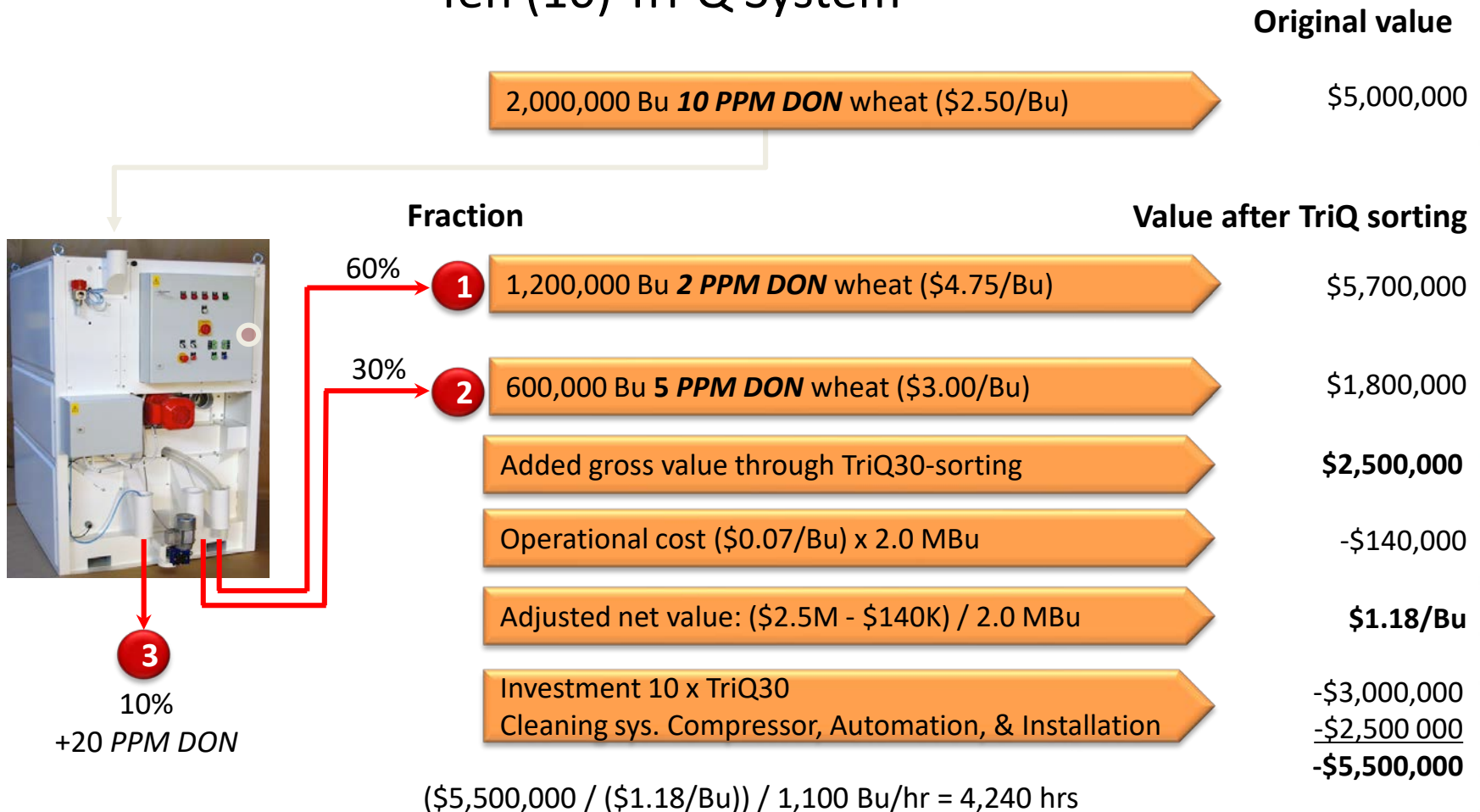


BoMill

Adds more value
to your grain



ROI: Quality sorting of *Vomitoxin* infested grain Ten (10) Tri-Q System



Return on Investment (2,000 hr/yr) 2.1 years



Ongoing Testing and Development

Oats – Protein Algorithm

Initial Tests: sorting results indicate protein spread of 13% to 20%

Seed –

Improve Germination

- High vitreous seed
- DON kernels sorted out



Development of hybrid seeds

- It has been shown that wheat seed sorted by protein can produce can result in higher protein crops with higher Zeleny values reflecting improved baking qualities



Adds more value
to your grain

BoMill Test Lab: Sweden



Cylindrical Grain Sizer

(2) Tri-Q Sorters

BRATNEY COMPANIES OVERVIEW



- ★ Field Sales Manager
- Technicians
- ★ Offices

Southeast accounts handled from Des Moines

Company Structure

- Field Sales Manager:
 - Geographical areas strategic with our clients.
 - Identify needs for process technology and /or project needs.
- Design / Engineering and Construction Group:
 - Handles qualified lead from sales group.
 - Works with client team to identify project scope, timelines, and budget.
 - Project Construction
 - Full time safety manager
- Field Technicians:
 - Factory Trained Technicians for start-up and training.
 - After sales service and support



DIVERSE AND EXTENSIVE FOOD EXPERIENCE

- Oat milling
- Edible corn conditioning
- Green coffee bean conditioning
- Popcorn conditioning
- Pea and lentil processing
- Potato processing
- Vegetable seed processing
- Corn
- Rice milling and packaging systems
- Soybeans – seed, edible & organic
- Flour milling
- Hop pelleting plants
- Spice cleaning and blending
- Sunflower processing plants
- Almond processing and packaging
- Malting, distilleries, and breweries



Our Customers



Proprietary Equipment Partners

- We align ourselves with industry leading process equipment providers who share our values including quality of manufacturing, innovative technology and customer service. Complementing systems that allow for a “systems approach” to a solution.

- Long Standing Exclusive Sales Agreements with:

- **Cimbria A/S**

- Conditioning equipment for agricultural products



- **Concetti North America Corp.**

- Packaging & Palletizing System



- **BoMill**

- Technology to single-kernel sort cereal grains based on protein, mycotoxin, and vitreous qualities



- **OMAS**

- Flour Milling technology for grains and specialty products





Cimbria A/S

- Air/Screen Grain Cleaners and Graders *
- Indent Cylinder Length Sizers *
- Gravity Tables and De-Stoners *
- Seed Treaters and Coaters
- Grain Driers
- Optical Sorters*
- Retractable Loading Spouts
- (*) Test Lab at our Des Moines, IA office



SEA Color Sorters

- **Chromex** – Best for complex applications sorting for multiple colors, size, and shape
 - Vegetable Seed
 - Beans
 - Sunflower
 - Nuts
- **True** – Ideal for applications running same product day after day with minimal operator adjustment
 - Wheat
 - Rice
 - Coffee beans
 - Corn
- **Both Models**
 - 1 to 7 Chutes
 - Full RGB Cameras with .06mm resolution
 - Capability of 4 cameras per chute
 - Optional NIR and InGaAS cameras



Capacity Guidelines

(based on average input quality)

Per Chute:

- Seed Corn: 150-175 bu/hr
- Seed Soybeans: 165 – 175 bu/hr
- Edible Beans (Blacks, Navy, Pinto, Kidney, Garbanzo): 8,000 – 10,000 lb/hr
- Milling Wheat: 9,000 – 11,000 lb/hr
- Rice: 8,000-9,000 lb/hr
- Nuts: 3,000-4,500 lb/hr
- Alfalfa: 800 – 1,200 lb/hr
- Coffee: 3,500 – 4,000 lb/hr
- Oats: 125 bu/hr
- Sunflowers: 3,000 – 4,000 lb/hr



CONCETTI AUTOMATED PACKAGING SYSTEMS

- Manufacturer of fully automated packaging systems including, weighers, baggers, palletizers
- Family owned – currently managed by third and fourth generations of Concetti family
 - 100 year anniversary Sept 2018
- Specialties
 - Automated packaging of difficult products
 - Full integration of third party equipment
- 200+ employees globally - Italy and Concetti North America (Georgia)
 - 40 skilled service technicians
- “we produce what we promise”



IMF BAGGING MACHINE

Fully automatic bagging system
with **two filling spouts**

Large empty bag magazine (three
positions or more)
Many **optional features** available

Range: 4 – 55 lbs
Up to **800** 55 lbs bags/hr
with de-aeration probes



Suitable for pre-formed open mouth bags constructed in different materials and formats
Various bag closures available



Omas Industries

- Roller Mills
- Flour Plainsifters
- Purifiers
- Bran Finishers
- Impact detachers
- Pneumatic systems

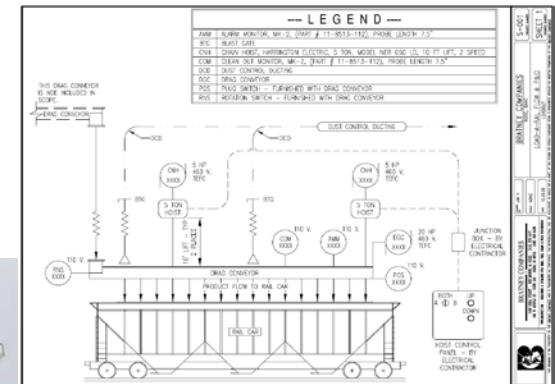
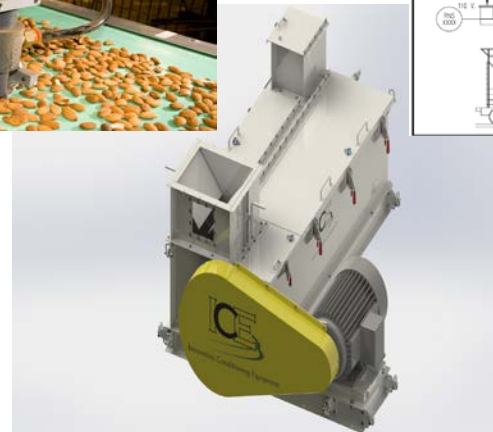
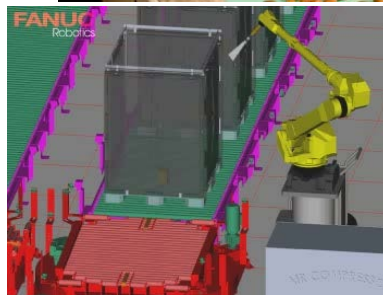
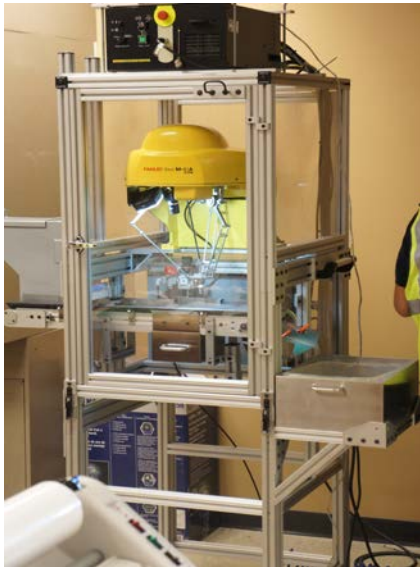




ICE

Innovative Conditioning Equipment
www.innovativeconditioning.com

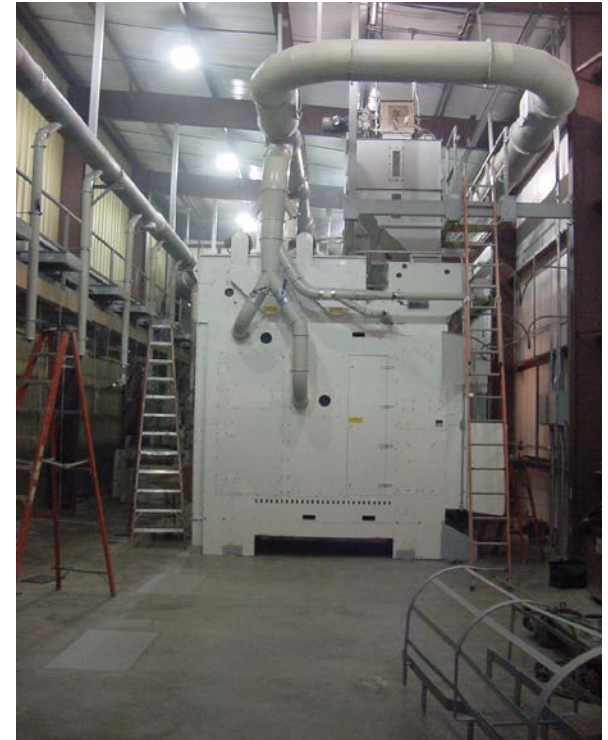
- A Bratney Company
- Developed to fill the role of developing solutions for our clients that manufacturers would not pursue.
- Utilize our resources to work with existing and new partners to develop and integrate a value added solution.



PIRMI Rice Milling (part of Bunge Group):

Upgrade to existing facility:

- New Process Cleaning line prior to rice dehullers
- Design and lay-out.
- Work with local contractor for installation



J.D. Heiskall Feed Milling System:

Upgrade to existing facility:

- 90 ton/hour Flaking Milling System for Dairy Feed
- Steam Chest above Roller Mills
- Counter-Flow Cooling
- Common Filling and Reclaim
- Plant Control System
- Design / Build Turnkey Construction



ConAgra Group:



New Facility 2016 Construction

10 ton/hour production capacity

Bratney Scope:

- Facility and Process Design/Engineering
- Procurement and Construction Management
- Installation, Millwrighting, and Commissioning



TURN-KEY FLOUR MILL

- Active project
- Milling capacity of 160T / 24hr
- Scope
 - Facility design
 - Process design
 - Procurement
 - Construction management
 - Millwright & Installation
 - Startup & Commissioning



Pennsylvania Flour Mill

New 2,750 CWT/Hr Flour Mill 2018-2019



New 2,750 CWT Flour Mill



Testing Facilities



Des Moines, Iowa



Sacramento, California

*Currently setting up color sorter in Colon, Argentina facility

Bratney Mobile Testing

We are ready to hit the road with our mobile trailer.

If you have a customer or multiple customers in close area of each other that need us to come to them, let us know!





THANK YOU