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 HQ, Malmo, Sweden
Bratney Offices
Other Partners
Installations TriQ
Installations IQ

BoMill Partners & Installations
BoMill Company Profile

- 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 Löfqvist 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
BOMILL ADDS VALVE TO SEVERAL GRAIN INDUSTRIES
SINGLE-KERNEL SORTING PRINCIPLES

Sort Barley, Wheat, and Durum by Internal Properties:

- Relative Protein Content
- Kernel Hardness (vitreous qualities)
- Vomitoxin (DON / Fusarium / Other Mycotoxins)
NIR Spectrum  
700nm-850nm  
BoMMill
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
**BoMill**

**BOMILL MODEL IQ SORTING REPORT**

**SAMPLE DETAILS**
- **Grain:** Hard Red Winter Wheat
- **Customer:**
- **Sorting Parameter:** Protein
- **Protein Reference:** 12.5%
- **DON in Reference:** 3.0 ppm

**Date:** 2/6/2018

<table>
<thead>
<tr>
<th></th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
<th>F5</th>
<th>F6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (lbs)</td>
<td>1.48</td>
<td>1.24</td>
<td>1.17</td>
<td>1.20</td>
<td>1.20</td>
<td>1.04</td>
</tr>
<tr>
<td>Yield (%)</td>
<td>20.2</td>
<td>16.9</td>
<td>16.0</td>
<td>16.4</td>
<td>16.4</td>
<td>14.2</td>
</tr>
<tr>
<td>Protein (%)</td>
<td>11.2</td>
<td>11.9</td>
<td>12.4</td>
<td>12.7</td>
<td>13.2</td>
<td>13.5</td>
</tr>
<tr>
<td>DON (ppm)</td>
<td>17.5</td>
<td>1.6</td>
<td>0.7</td>
<td>0.4</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Germination (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Basic Function of the BoMill TriQ

Near-infrared Light

Kernel

Receiver

(10) measurements per kernel

NIR Transmitter

Ejectors

Outlets

F1
F2
F3
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

- 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

B Detector system

C Ejection system

Micro-Processors
Basic Function of the BoMill TriQ – Sorting

Collection Troughs for 3 fractions (Singulator Drum removed)

Outlets
(3) Sorted Fractions
Model Tri-Q
Excellent Access to Key Components
Model Tri-Q Controls
FOOD SAFETY - FOOD SECURITY

TYPICAL VOMITOXIN (DON) DISTRIBUTION IN GRAIN

Canadian grading

- **SALVAGE**: > 10,0 ppm
- **FEED**: < 5,0 ppm
- **FOOD**: < 1,0 ppm
- **BABY FOOD**: < 0,2 ppm

Origin ppm DON unsorted grain

Reference: Canadian International Grain Institute Harvest 2014, Canada
Vomitoxin – Sample 1

<table>
<thead>
<tr>
<th>Sample of wheat (HRS)</th>
<th>Unsorted</th>
</tr>
</thead>
<tbody>
<tr>
<td>DON Yield</td>
<td>3.00 ppm 100%</td>
</tr>
</tbody>
</table>
## Sorting of Sample 1 into 2 fractions

### Sample of wheat (Hard Red Spring)

<table>
<thead>
<tr>
<th>DON/ppm</th>
<th>Unsorted</th>
<th>Fraction 1</th>
<th>Fraction 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>DON</td>
<td>3.00 ppm</td>
<td>&gt;12.00 ppm</td>
<td>0.84 ppm</td>
</tr>
<tr>
<td>Yield</td>
<td>100%</td>
<td>6.5%</td>
<td>93.5%</td>
</tr>
</tbody>
</table>

![Graph showing sorting of Sample 1 into 2 fractions](image-url)
SPRING WHEAT (3.0 ppm DON)

pre-screened at 5.5/64” or 2.2 mm

Weight % per fraction (of total sample)

F1 - Low: 4%
F2: 5%
F3: 4%
F4: 37%
F5: 34%
F6 - High: 15%

Weight (g):

- F1: 114, 10.30
- F2: 138, 3.00
- F3: 108, 1.47
- F4: 936, 1.53
- F5: 868, 0.83
- F6: 394, 0.30

4% Salvage
5% Blend
96% Flour wheat = ca 1.15 ppm
WINTER WHEAT (6.0 ppm DON)

pre-screened at 5.5/64” or 2.2 mm

Weight % per fraction (of total sample)

<table>
<thead>
<tr>
<th>Fraction</th>
<th>6%</th>
<th>13%</th>
<th>23%</th>
<th>23%</th>
<th>26%</th>
<th>9%</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1 - Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F3</td>
<td></td>
<td></td>
<td>23%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F4</td>
<td></td>
<td></td>
<td>23%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>26%</td>
<td></td>
</tr>
<tr>
<td>F6 - High</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9%</td>
</tr>
</tbody>
</table>

DON (ppm) 44.5 8.2 3.9 1.8 1.3 0.8

∑ DON (ppm) 2.1 – 81% yield

∑ DON (ppm) 1.4 – 58% yield
ROI: Quality sorting of *vomitoxin* infested grain

**Fraction**

1. **1,000,000 Bu 5 PPM DON** wheat ($2.50/Bu)
   - Original value: $2,500,000

2. **800,000 Bu 2 PPM DON** wheat ($4.50/Bu)
   - Value after TriQ sorting: $3,600,000
   - Operational cost ($0.07/Bu) x 1.0M Bu
     - $70,000

3. **200,000 Bu +10 PPM DON** wheat ($1.50/Bu)
   - Value after TriQ sorting: $1,400,000
   - Adjusted added value (1.4M – 70K) / 1.0M Bu
     - $1.33/Bu
   - Investment 2 x TriQ30
     - Cleaning system, automation, and installation
     - -$620,000
     - -$500,000
     - -$1,120,000

Total:

- ($1,120,000 / ($1.33/Bu)) / 220Bu/hr = 3,830 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
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)
DURUM GRAIN TERMINAL

One of the world's leading Durum traders with 5 BoMill TriQs
SEMOLINA MILL: MOLINO CASILLO - ITALY

Some facts:
One of the world's leading private semolina milling facilities with 3 mills
Grain elevator: Varaslättens lagerhus - SWEDEN

Some facts:
- Founded 1930
- Owned by 1,900 farmers in western Sweden
- Grain storage 135,000 mt
- Trades 250,000 mt annually

BoMill TriQ

TriQ connected the customers main SCADA interface for remote control.

SCADA: Supervisory control and data acquisition

Site

Pre-design

Installed TriQ

Automation

TriQ installed on the 7th floor
FEED MILL: Winnipeg, CANADA

DON/Vomitoxin sorting out of Barley and Durum
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

1. 2,000,000 Bu 10 PPM DON wheat ($2.50/Bu)
   - Original value: $5,000,000

   - Fraction:
     - 60%: 1,200,000 Bu 2 PPM DON wheat ($4.75/Bu)
     - Value after TriQ sorting: $5,700,000
     - Added gross value through TriQ30-sorting
     - Operational cost ($0.07/Bu) x 2.0 MBu
     - Adjusted net value: ($2.5M - $140K) / 2.0 MBu
     - Investment 10 x TriQ30
     - Cleaning sys. Compressor, Automation, & Installation
     - ($5,500,000 / ($1.18/Bu)) / 1,100 Bu/hr = 4,240 hrs

   - 30%: 600,000 Bu 5 PPM DON wheat ($3.00/Bu)
     - Value after TriQ sorting: $1,800,000

   - 10%: 120,000 Bu +20 PPM DON
     - Value after TriQ sorting: -$2,500,000

2. 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
BoMill Test Lab: Sweden

Cylindrical Grain Sizer

(2) Tri-Q Sorters

BoMill
Adds more value to your grain
BRATNEY COMPANIES OVERVIEW
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”
Suitable for pre-formed open mouth bags constructed in different materials and formats

Various bag closures available

**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

www.bratney.com
Omas Industries

- Roller Mills
- Flour Plainsifters
- Purifiers
- Bran Finishers
- Impact Detachers
- Pneumatic systems
ICE

- 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