Cgrain VALUE™

Viking Malt facility in Halmstad, Sweden.
Courtesy of VIKING MALT.

Cgrain Value for the inspection of malting barley for defects and impurities

Malting barley is barley used to produce high quality malt. It is a specialty crop for which a premium is paid by traders, maltsters and exporters. Quality requirements for malting barley are strict and relate directly to efficiency in processing and product quality of the malt used by the malting and brewing industries. Many of the characteristics required are under the control of the farmer while others are seasonal or weather dependent.

Save Time and Money
using innovative AI Technology

The new standard for analysing grain quality

Production of malt from barley

During germination, with careful control of temperature, moisture and time, the kernels are allowed to germinate to a point where starch hydrolyzing enzymes have been produced and the grain structure is modified to permit efficient hydrolysis of starch into sugars.

Drying of the green malt, called kilning, reduces the moisture content of the kernels. This stops the biochemical processes but preserves the enzymes. After the kilning, which can be performed using different temperatures and time which influence the color and flavor, the malt can be cured by roasting. Malt is one of the key ingredients in the production of beer and other alcoholic beverages like whiskey.

Quality criteria for malting barley.

High quality malting barley is characterized by excellent germination (typically above 95%), a relatively low protein content (e.g. 9,5- 11,5%), a moisture content below 13,5-14,5%, and free of odor. The kernels should be plump and of uniform size, show no signs of pre-harvest germination and no or a very low number of red (Fusarium), skinned and broken kernels. The barley must be free from insects, admixtures, and ergot. Germination is analyzed by growing them in an incubator for 3 days. Protein and moisture content are analyzed using NIT technology. The remaining characteristics, including defects and impurities, are traditionally analyzed by visual inspection by specially trained, experienced laboratory personnel.

Inspection of malting barley

Cgrain now introduce the Cgrain Value™ for your inspection of malting Barley. The Cgrain Value™analyzer utilizes image analysis based on Artificial Intelligence - Neural Networking technology on singulated kernels.

More objective inspection

When humans analyze quality visually, there is a high degree of subjectivity. Many of the methods described for visual grain analysis are very hard to quantify in a consistent way. This can be due to inconsistencies in staff training as well as differences in the perception of colors.

Cgrain Value™ – patented mirror design

The patented unique mirror arrangement provides three views of every kernel and allows the inspection of more than 95% of the surface of each kernel for defects. Combined with the highest resolution, measured as pixels per kernel, this gives a very powerful tool for automated visual inspections of malting barley, allowing for a high detection rate as well as good repeatability regardless of the orientation of the kernels. This is particularly important for Fusarium-affected barley, as the pink color of Fusarium might only be visible on one part of the kernel.
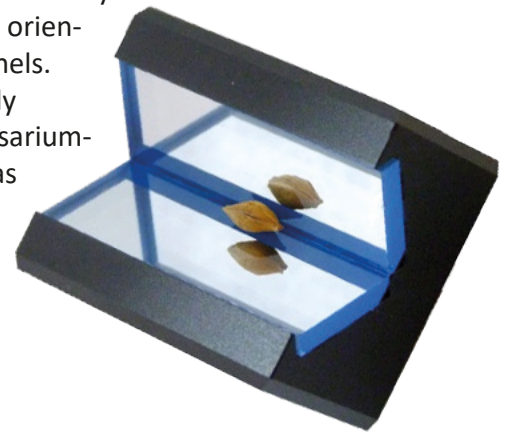
Visual analysis is highly subjective

The current method for analyzing properties such as coloration is a highly subjective method and it produces highly variable results.

The high variability of visual analyses for Fusarium is shown below. Although generally this variability is estimated at 30%, it can be much greater depending on the samples.

Using Cgrain Value™, your results will be more consistent, since each kernel is inspected the same way every time at a speed of 8-12 kernels per second.

Pink kernels in Barley
Four different manual analysis
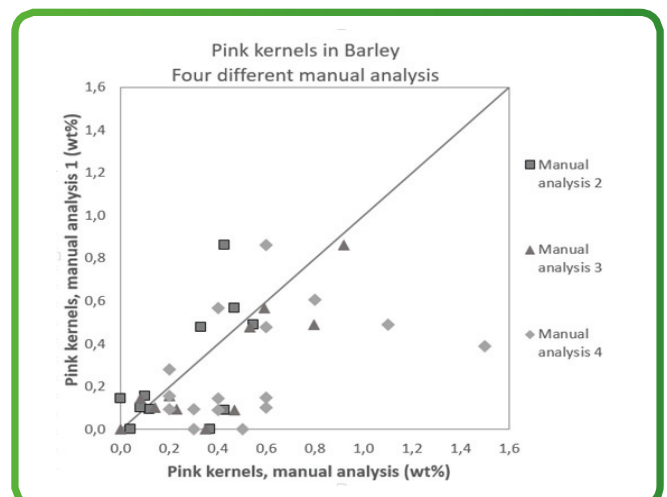
Easy-to-use

Cgrain Value™ has an easy-to-use interface with touch screen and a separate monitor for viewing pictures in a larger format. The procedure for viewing pictures is very easy. The manual labor required is reduced to a fraction of the time it takes to do the sample manually, yet the results are obtained to a very high degree of accuracy. Below is an example of results from Cgrain Value™.

Reference: BARLEYCONTROL1	Seed Count:		998	Weight:	50.50 g
Filtered As	**Count**	**Percentage**	**Weight**		
Sieving >2.2	990	99.57	50.28		
Sieving >2.5	938	96.08	48.52		
Sieving >2.8	761	81.91	41.36		
Other	0	0	0		
Barley	971	97.65	49.31		
Foreign	10	0.77	0.39		
Weed	0	0	0		
Green	4	0.32	0.16		
Broken	4	0.34	0.17		
Pink	9	0.91	0.46		

| View	Print	Stats.	Export XML	Close

Current Calibration

The current Calibrated defects and impurities are: broken kernels, skinned kernels, split kernels, gaped kernels, green seeds, moldy kernels, pink kernels (Fusarium), ergot, admixture (other cereal, weed seeds, chaff and foreign material such as stones, mud, dirt).

Fusarium fungus in malting barley

Fusarium in malting barley significantly reduces its quality. It produces a variety of mycotoxins and is thought to be one of the causes of 'gushing' - beer spraying uncontrollably from the opened bottle. The most reliable sign of Fusarium-affected barley is pink coloring on the kernel.

Advantages of the Cgrain Value™ to flat-bed systems are that the detection of defects uses the entire surface of the grain and is independent of the orientation of the kernel in the image.

The image below shows how Cgrain Value™ can detect the pink color in the left side view, i.e. on the back side of the kernel. This ensures a high detection rate and repeatability, regardless of how kernels are oriented.
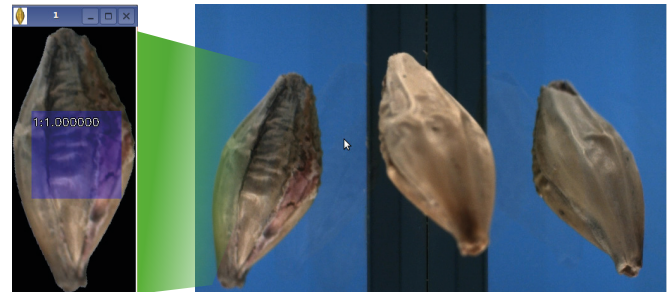
An analysis of a sample spiked with 5 pink fusarium infested barley kernels using the Cgrain Value™'s imaging system showed that after analyzing the three views from every image generated from the sample, the Cgrain Value™ detected 4.6 kernels on average (n=10). When doing this analysis using only the central view of each image, representing an analysis performed without a mirror system, an average (n=10) of only 2.8 kernels was detected and the coefficient of variation increased from 15% to 55% for these 10 analyses.

10 repetitions	No grains assessed as pink analyzing only the cantral view of the kernel	No grains assessed as pink using all three views of the kernel
Mean		
Highest no detected	2,8	4,6
lowest no detected	0	3
Mean detection, %	56%	92%
Standard Deviation	1,5	0,7
Coefficient of variation	55%	15%

Cgrain Value™ gives greater repeatability for pink barley than visual analysis and it analyses the same way every time.

Many quality defects analyzed at once

Using Cgrain Value, many quality parameters for the malting industry are measured simultaneously, some of which can't be determined visually, see examples below. One example is grain size distribution, a parameter impossible to measure in any other way. Quality parameters that are obtained simultaneously include:

• Foreign seeds
• Broken kernels
• Green seeds
• Pink kernels
• Skinned kernels
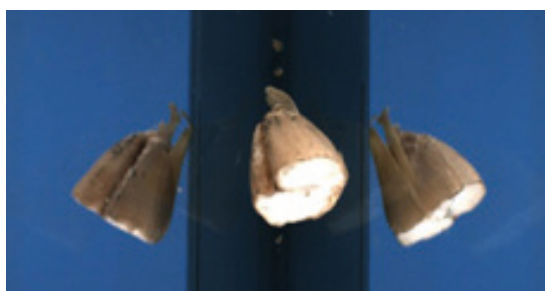• Size distribution/Sieving analysis

Examples of defects in Barley

a fusarium-affected kernel

a skinned kernel

a broken kernel

Specifications

Dimensions (WxDxH):	600x400x370 mm
Weight:	38 kg
Power usage:	110-160 W
	incl internal monitor
Analysis principle:	RGB imaging
Interface:	3 USB-ports, RJ45 Network
Analysis speed	8-12 kernels/second
Sample size:	25-500 grams
Sample particle size:	1- 5 mm width

Installation requirements

Voltage supply:	100-240V AC, frequency 50-60 Hz, Class 1, protective earth
Mechanical environment:	Stable during use

For more information please contact us:

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