Automatic Sampling Systems Requirements

Randy Dennis
Chief Grain Inspector for Canada
October 16, 2015
About the Canadian Grain Commission

- Federal government agency
- Canada’s scientific research organization on grain quality
- Report to Parliament
  - Through Minister of Agriculture and Agri-Food Canada
- Operate under *Canada Grain Act*
- Regulate 20 grains
- Certify quality, safety and weight of grain
Canadian Grain Commission’s Role

- Inspects, approves and oversees the operation of all automatic sampling systems at terminal locations in accordance with the Sampling Systems Handbook and Approval Guide.
Sampling Handbook and Approval Guide

- Outlines the policies and procedures of the Canadian Grain Commission (CGC) for automatic mechanical sampling systems
- Includes the requirements for the installation, examination, testing, approval, and ongoing monitoring and oversight of these systems
Responsibilities

- Inspect, approve and oversee the operation of all automatic sampling systems at licensed terminal grain handling facilities
- Used to draw official samples for cargo destined for direct export
- Oversight role for inward sampler and delivery systems used for receipt of grain at licensed terminal elevators
- These systems are subject to regular monitoring and oversight protocols established by the CGC
Goal $\rightarrow$ obtain a meaningful result

$2.1 \pm 1.0 \, \mu g/kg$
The principle of random sampling is that each particle in the population being sampled has an equal chance of being selected.

What does that mean?

- Proper equipment and installation
- Proper operation and maintenance
Sampler Location

Receiving sampler

Shipping sampler
Inward Receipt of Grain

- Roof top aspiration caps
- Lofter / top head floor
- Garner floor
- Scale floor
- Distribution floor
- Receiving leg
- Cleaner and/or house bins
- Hopper rail car loading spouts
- Track / car shed
- Unload pit
- Basement and boot area
- Sampler
- Cleaning floor
- Upper garner
- Lower garner
Components of a Sampling System

- Sampler
- Divider
- Sample receiver
- Cyclone
- Delivery lines
- Rotary valve
- Sample collector
- Blower
- Muffler and exhaust
Equipment-Sampler

- Sampling mechanism must have the ability to extract a complete two dimensional (height and width) section of the grain stream.
Belt End Type

Cutter

Pelican

Grain flow

To office

Grain flow

Belt-end Sampler
Cross Stream Type

Cross-stream sampling

Cutter

Pelican

To office

Grain flow

Cross-stream sampling
Sampler – Cutter & Pelican

- Cutter bars are installed at the front of the pelican, and determine the width of the opening.
- Pelican-designed to capture the grain that has been selected by the cutter from the grain flow, collected grain discharges from the back/bottom of the pelican continuously.
Equipment - Dividers

- Swing arm type
- Rotary type
- Gravity type

Divider openings
Components of a Delivery System

- Sample receiver
- Delivery line
- Cyclone
- Sample collector
- Blower
- Muffler and exhaust
Sample Receiver

Sample receiver

- Installed after the divider, is the transition point from gravity to pneumatic sample delivery.
- Designed to allow air into a pneumatic sample delivery system.

Air is drawn into system at this point
Vent

Intended to help neutralize positive or negative air pressures within a gravity sample delivery system. There can be numerous vents in one system.
Cyclone

- Designed to allow a sample to decelerate and transition to a gravity delivery system or to another pneumatic system depending upon the installation.
Rotary Valve

- Designed to neutralize the pressure between a pneumatic delivery system and a gravity system.
Blower

- Designed to create negative air pressure (vacuum) or positive air pressure (blow) to move grain through the delivery pipes.
Muffler

- Designed to reduce noise
- Is installed after the blower in a pneumatic delivery system
Sample Collector

• Designed collect and maintain the integrity of the sample.
Delivery Line Evaluation

- Test to determine that delivery lines are installed correctly
- Used on both pneumatic and gravity lines
- 6 grain samples (2 different grains) of known components
- Results analyzed

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Location</th>
<th>Sampler Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Shipper</th>
<th>Receiver</th>
<th>Date</th>
<th>CGC Evaluator(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>4167.50</td>
<td>64.50</td>
<td>100.07</td>
</tr>
<tr>
<td>Result</td>
<td>4187.80</td>
<td>63.30</td>
<td>93.20</td>
</tr>
<tr>
<td>Variance</td>
<td>0.20</td>
<td>-2.20</td>
<td>-6.87</td>
</tr>
<tr>
<td>% Variance</td>
<td>0.00</td>
<td>-3.40</td>
<td>-5.87</td>
</tr>
<tr>
<td>% Variance</td>
<td></td>
<td></td>
<td>-0.74</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-4.84</td>
</tr>
<tr>
<td>Sample B</td>
<td>E</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>4215.30</td>
<td>69.10</td>
<td>108.50</td>
</tr>
<tr>
<td>Result</td>
<td>4217.10</td>
<td>85.80</td>
<td>102.40</td>
</tr>
<tr>
<td>Variance</td>
<td>1.80</td>
<td>-3.50</td>
<td>-6.10</td>
</tr>
<tr>
<td>% Variance</td>
<td>0.04</td>
<td>-5.07</td>
<td>-5.62</td>
</tr>
<tr>
<td>% Variance</td>
<td></td>
<td></td>
<td>-5.37</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-5.40</td>
</tr>
<tr>
<td>Sample C</td>
<td>F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>4191.40</td>
<td>71.00</td>
<td>99.22</td>
</tr>
<tr>
<td>Result</td>
<td>4223.20</td>
<td>69.20</td>
<td>105.70</td>
</tr>
<tr>
<td>Variance</td>
<td>31.80</td>
<td>-1.80</td>
<td>7.48</td>
</tr>
<tr>
<td>% Variance</td>
<td>0.70</td>
<td>-2.54</td>
<td>7.54</td>
</tr>
<tr>
<td>% Variance</td>
<td></td>
<td></td>
<td>-5.54</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.91</td>
</tr>
</tbody>
</table>
Timers

- Under control of the CGC
- Maximum interval setting is 20 seconds when receiving
- Maximum interval setting is 45 seconds when shipping
Monitoring Protocol

- All CGC approved sampling systems are monitored to ensure continued compliance to the Sampling Systems Handbook and Approval Guide.
Continuous Monitoring - Receivers

- Equipment Verification
- Quarterly inspection
- External Notification
- Annual inspection
Continuous Monitoring - Shippers

- Equipment Verification
- Daily inspection
- 36 month inspection
- Quarterly inspection
Notification

- When systems are determined to be non-compliant
  - Notification to facility verbally and in writing
  - Timelines for rectification are determined basis impact on representativeness of the sample
Testing is a process

primary sampling

secondary sampling and sample preparation

test portion

chemical analysis
<table>
<thead>
<tr>
<th>Certificate Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Certificate Final Image]</td>
</tr>
</tbody>
</table>

**Certificate Final**

---

<table>
<thead>
<tr>
<th>Vessel / Navire</th>
<th>Port</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product / Produit</td>
<td>Grade</td>
<td>Weight in tonnes</td>
</tr>
<tr>
<td>Stowage / Aménagement</td>
<td>Remarks / Remarques</td>
<td></td>
</tr>
</tbody>
</table>

**For account of / Pour le compte de**

**Inspector / Inspecteur**

**Weighter / Peseur**

**Certified by / Validé par**

**CGC Industry Services – ISO 9001-2000 – Services à l’industrie CCG**

**W-300**

**2004-08**
Statement of Assurance – Letter of Analysis

- Pesticide residues
- Chemical residues
- Human consumption
- Aflatoxins
- Heavy metals
- Radionuclides

- Various analytical tests;
- Deoxynivalenol (DON),
- Wet gluten,
- Oil content,
- Protein,
- Falling number, etc
Canadian grain destined to countries around the world