

Falling Number

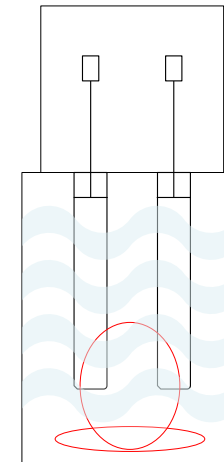
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Technology and Science Division | FGIS | AMS | USDA

Prairie Grains Conference
December 12, 2019

Link to our video in the presentation: <https://www.ams.usda.gov/resources/video-library>

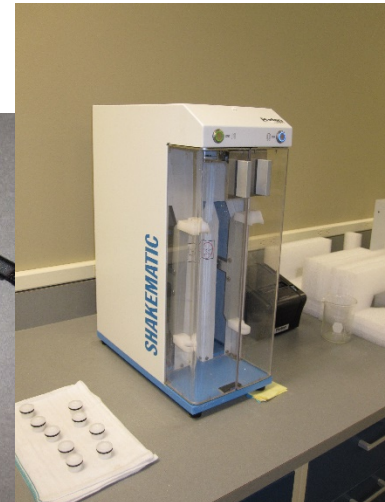
Falling Number (FN) Method

- Indirect measurement of alpha-amylase activity
- Alpha-amylase breaks down starch
- High activity adversely affects end-use quality
- Important factor in domestic and international trade of wheat (not official grading factor)
- Internationally standardized and most widely accepted method
- FN is the time required to mix and drop rod through heated wheat meal / water slurry
- FN inversely proportional to alpha-amylase activity



Improvements to Falling Number Test

- FGIS implemented two improvements May 1, 2019
- FN Directive 9180.38
 - Correction to sea level using barometric pressure
 - Requirement of Shakematic use
- Better alignment between labs
- Promote fair trade
- Falling Number video online
 - <https://www.ams.usda.gov/resources/video-library>

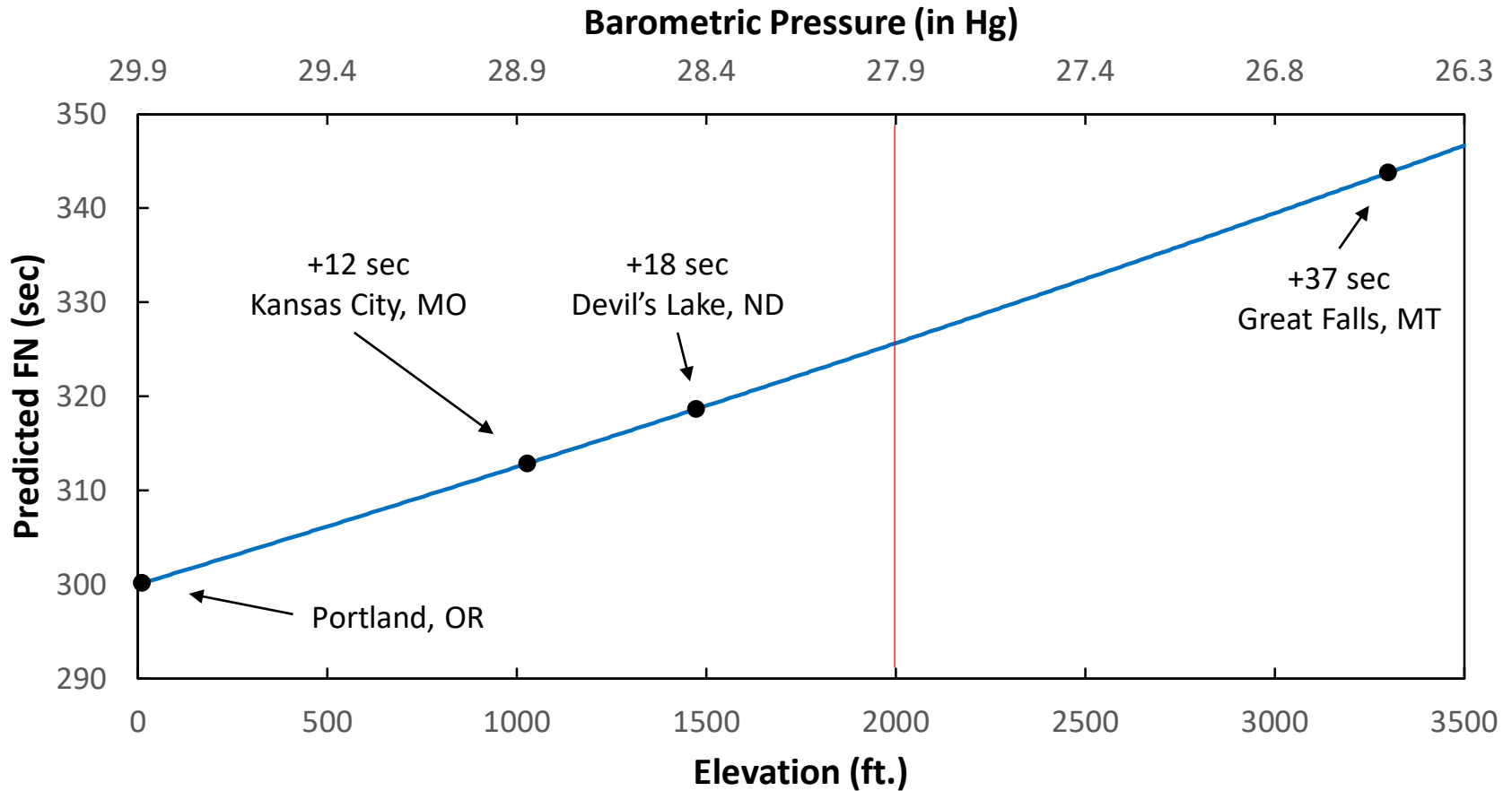


Correcting FN to Sea Level

- Increase in elevation leads to increase in FN
- Previous FGIS procedure
 - Correct to sea level at locations 2000 ft. and above
 - Cereal Chem. **1994**,71(3), 269–271
 - Correction needed below 2000 ft. to remove bias
- New FGIS procedure
 - FGIS engaged USDA Agricultural Research Service
 - Correct to sea level using barometric pressure
 - Cereal Chem. **2018**, 00, 1–8

Effect of Elevation on Falling Number

Example: FN = 300 sec at sea level



Sample Shaking Method

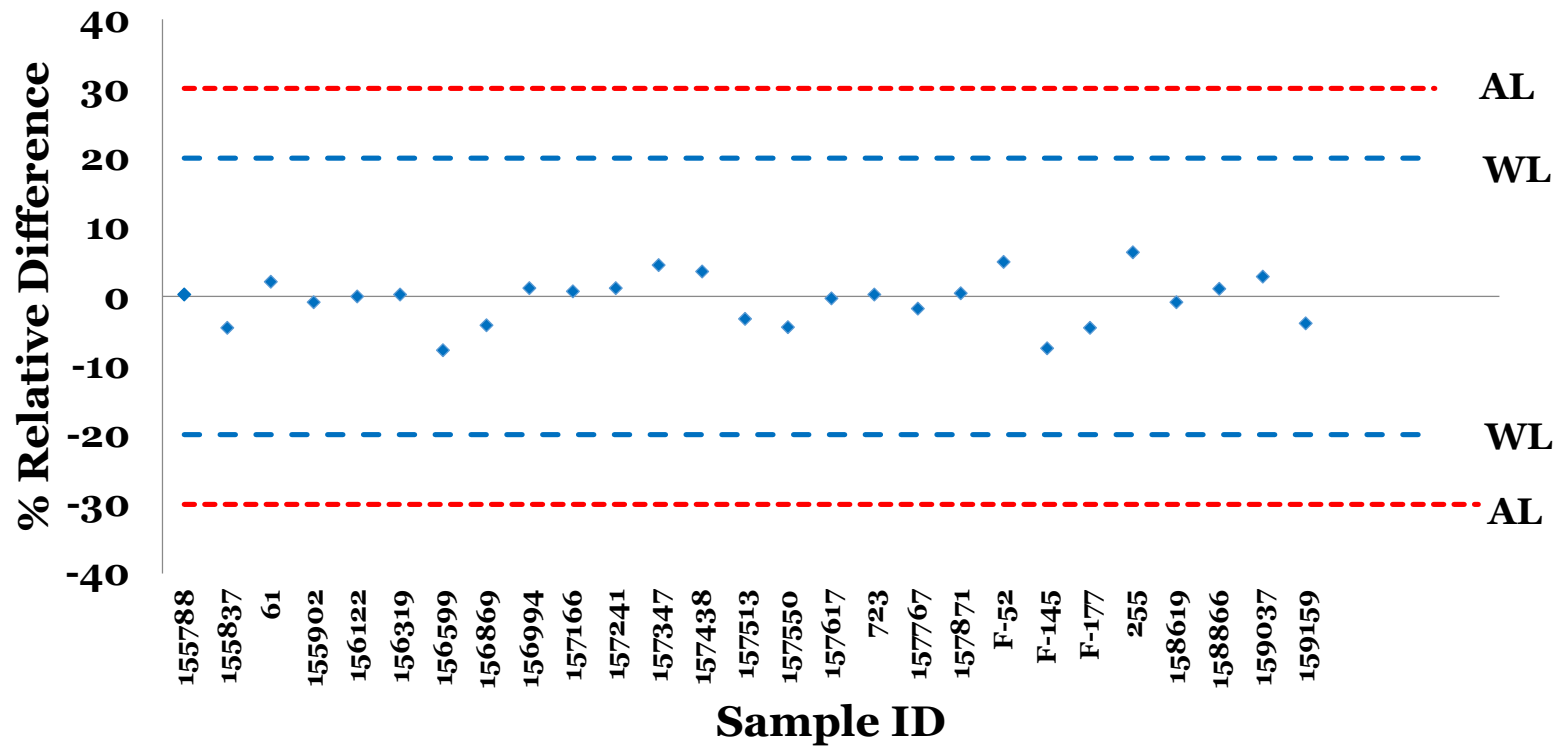
- Sample / water homogenization required
- FGIS allowed shaking by hand or Shakematic
- FGIS compared the two shaking methods
- FGIS now requires Shakematic
 - Eliminates fatigue
 - Provides more consistent mixing
 - Most official service providers used Shakematic



Falling Number Monitoring Program

- Official Service Providers (OSP) are required to submit one sample/instrument each week
- FN Directive 9180.84
- Technology and Science Division (TSD) tests the samples
- TSD and OSP data are graphed
 - Established limits for data, look for bias
 - Relative Difference (OSP result-TSD result/TSD result *100)
 - Work with OSP when issues are seen (email, phone, site visits, training at TSD)
 - Require validation of new or repaired instruments

Falling Number Monitoring Program



Falling Number Check Sample Program

- Every six months TSD sends out four check samples
- OSP test the samples
- OSP and TSD data is compiled and compared
 - Report generated
 - Shows OSP how they compare to others and overall AVG
 - Overall RSD generally below 5% for ~52 instruments
(SD/Mean*100)

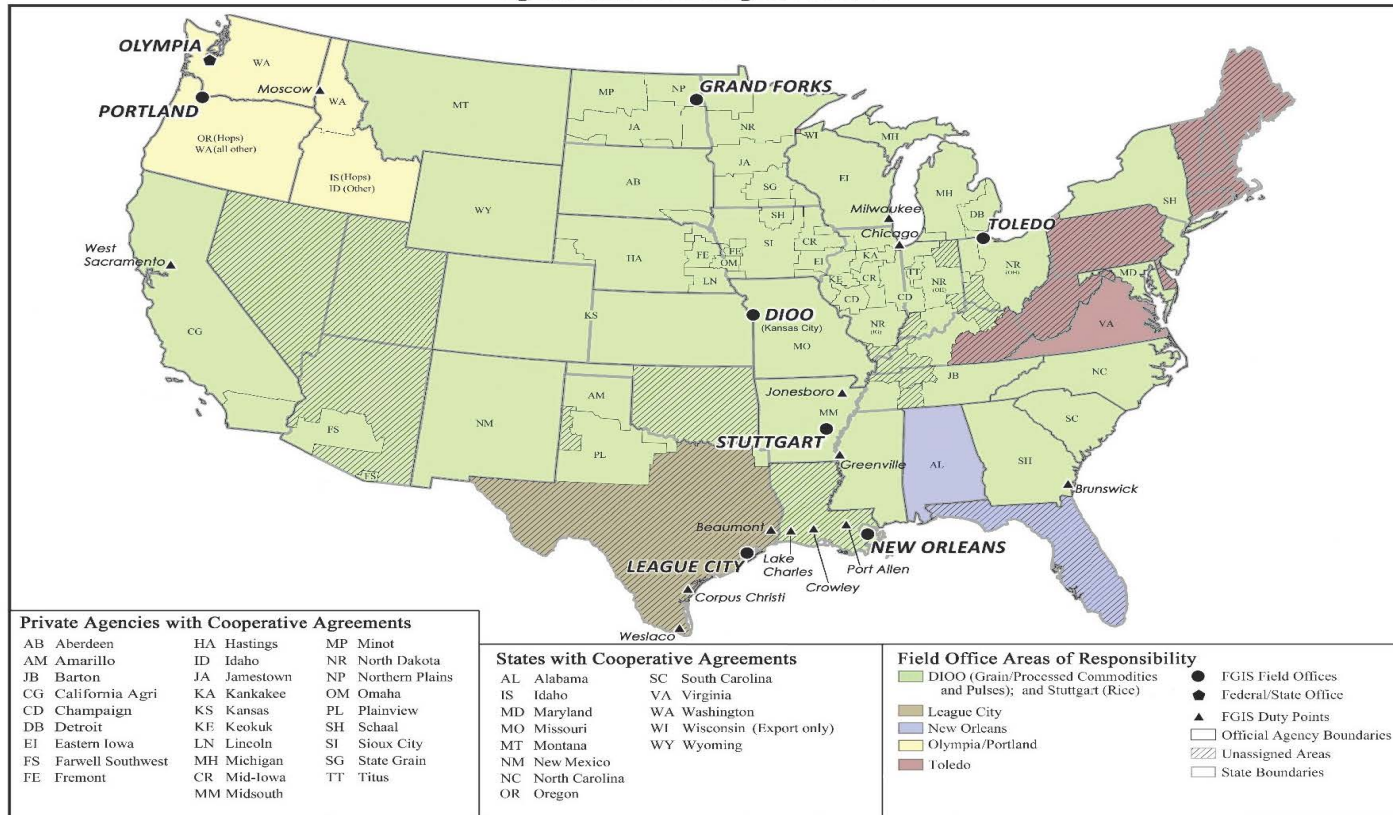
Falling Number

- Perten, the FN manufacturer, recommends that repeated tests on the same sample within the same laboratory should agree within +/- 5% of the average FN value.
- Official FGIS results are tested in duplicate and must pass the 5% rule (unless over 400 seconds).

Falling Number Retest and Appeal

- A retest and/or appeal inspection is available upon request by the applicant.
- A retest inspection may be performed by the same office that performed the original inspection.
- An appeal inspection, when requested by the applicant, may be performed by an FGIS field office, TSD, or Federal/State office that monitored the office that performed the original inspection or retest.
- DIOO (Domestic Inspection Operations Office)

OFFICIAL AGENCY GEOGRAPHIC AREAS AND FGIS FIELD OFFICES Agricultural Marketing Act of 1946



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Area Official Service Providers

- North Dakota Grain Inspection (Fargo, ND)
- Northern Plains Grain Inspection (Grand Forks, ND)
- Grain Inspection Inc. (Jamestown and New Salem, ND, Appleton, MN)
- Montana State Grain (Great Falls, MT)