

Metrological control system for grain protein measuring instruments

Grahame Harvey^a, Brian Osborne^b and Ian Wesley^b

^aNational Standards Commission, PO Box 282, North Ryde, NSW 2113, Australia

^bBRI Australia Ltd, PO Box 7, North Ryde, NSW 1670, Australia

Introduction

Background

Australia has in place trade measurement legislation that covers measurements “in use for trade”, meaning used to determine the consideration of a transaction – that includes determination of both the quantity of the commodity (the usual trade measurement focus) and the unit price. Therefore, instruments used to make measurements of protein content and other quality parameters that determine the unit price of grain are “in use for trade” and should be verified and pattern approved. Pattern approval is the process whereby an impartial body examines the pattern (design) of an instrument prototype against a National Standard. This determines whether an instrument is capable of retaining its calibration over a range of environmental and operating conditions and ensures that the instrument is not capable of facilitating fraud. Verification is the process whereby individual instruments are examined to ensure that they meet the requirements of the Standard. The first step in establishment of a metrological control system for grain quality testing is the implementation of the relevant National Standard (M8).

National Standard M8

The National Standards Commission is the body responsible for co-ordination of national measurement systems in Australia. The Commission is committed to international harmonisation of requirements for measuring instruments under the International Convention on Legal Metrology and as prescribed in the National Measurement Act. In the absence of a recommendation of the International Organisation on Legal Metrology (OIML) on grain protein measurement, the Commission convened a Committee on Grain Quality Measurements with broad industry representation from grain growers, bulk handlers, NACMA, the Flour Millers’ Council of Australia, AWB Ltd, BRI Australia Ltd/NIR Centre and trade measurement authorities. The Committee has drafted National Standard M8 “Pattern Approval Specifications for Protein Measuring Instruments for Grain”. The Standard is based on OIML D11 (1994) “General Requirements for Electronic Measuring Instruments” and current practice within the Australian grains industry. The basic principles of the Standard are that it is technology non-specific with a single maximum permissible error (MPE) irrespective of technology (i.e., this is not an NIR standard even though the majority of instruments involved will be NIR-based).

On 4th December 2002, a draft of National Standard M8 was posted on the Commission's website at www.nsc.gov.au for public comment. The Standard together with a document on metrological control can be found by clicking on the "What's New" button. Comments received to date have also been posted on the site.

Maximum permissible error (MPE)

The MPE is an important part of the Standard. It is the value of the maximum difference between the measurement of protein on a given instrument and the reference value, determined according to the RACI Dumas method, for any sample used to verify the performance of that instrument. The proposed MPEs are 0.4% for wheat and 0.5% for barley. Assuming a Normal distribution of errors, these are equivalent to Standard Deviations of Differences of 0.20% and 0.25% at 95% confidence.

Testing and certification of instruments

Pattern approval testing

All instruments in use for trade for the measurement of grain protein will require pattern approval. The National Measurement Act and the National Measurement (Patterns of Measuring Instruments) Regulations provide for the Commission to carry out pattern approval testing of instruments, give approvals and issue certificates. Instrument suppliers will need to apply to the Commission for pattern approval and provide at least one sample instrument of each pattern for testing at their North Ryde laboratory. The testing program is designed to verify instrument precision and stability in a specified environment and under specified conditions (temperature, humidity, voltage disturbances, electromagnetic field). Each instrument type that meets Standard M8 will be given a certificate, including a technical commentary on matters such as calibration, sub-sampling etc, and a list will be posted on the Commission's website. To provide for the seamless introduction of metrological controls and subject to some basic requirements, the Commission is prepared to issue a series of special approvals for protein measuring instruments currently in use for trade. This will provide for the continued use of those instruments and avoid unnecessary disruption.

Verification and certification

This is the process whereby individual instruments that have pattern approval are inspected to ensure that they comply with the approved pattern, calibrated to ensure they are operating within the MPEs and marked to indicate that verification has occurred. This function will be carried out by the State and Territory trade measurement authorities using a set of certified reference samples with known protein content. Laboratories and other testing facilities that carry out grain protein testing "for use in trade" will need to apply to their local authority for verification. Failure to do this or to use an instrument that has failed to meet the MPE is an offence carrying a fine of up to \$100,000. Stand alone instruments are to be certified annually prior to the harvest season and on a regular basis throughout the harvest season as required by trade measurement authorities. As an alternative to the latter, instruments that are the subject of a quality system authorised by the relevant state authority may have their quality system audited during the season.

International implications

Since Australia has adopted a leadership position in the metrological control of grain quality measuring instruments, OIML have established Technical Committee 17 Sub-Committee 8 on agricultural quality measurements with Australia as the secretariat. The Committee will consider international harmonisation of Standard M8 to smooth the introduction of legal standards around the world.