

Meat technology – information sheet

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MQ-27 Chemical Lean Meat Analyser

Boning rooms throughout Australia need rapid and accurate estimates of the chemical lean (CL) content of their product. The MQ-27 electromagnetic scanning equipment provides rapid results, can estimate the CL of whole cartons of unfrozen bulk-packed meat and can sample 100% of the production.

The Meat Research Corporation supported the initial development of the original MQ-25, the forerunner of the MQ-27, from other electromagnetic-scanning (EMS) equipment used to measure the body composition of humans.

As a result of this work, several EMS machines have been installed in Australian boning rooms to estimate the CL content of cold-boned meat and, in one instance, hot-boned meat.

The EMS machine has one main advantage: its use eliminates the errors involved in sampling cartons for CL testing.

Sampling errors arise because only a small number of cartons can be sampled and therefore the sample does not fully represent the production. Additionally,

collecting samples by coring cartons is labour-intensive and may introduce a bias. Use of EMS, on the other hand, reduces labour requirements and avoids any chance of sampling bias. Meat loss through destruction in testing is eliminated.

Since 100% of production can be tested and every carton is included in the final average of the production lot, individual cartons not within a predetermined range of the average specification can be eliminated. Thus, the spread of carton CL values within a shipment contract can be minimised.

How the equipment works

With the MQ-27, one can automatically accumulate the lean meat content for each sealed carton product description that goes down the production line (Fig. 1). A conveyor carries cartons through the equipment at a rate of up to 20 cartons per minute. The percent lean is measured by the use of electromagnetic scanning.

The MQ-27 can interface to a carton-labelling system via a standard RS232C interface, allowing automatic lean grouping and averaging of cartons produced. This instant feedback can be used to make quality control adjustments on the boning line immediately.

The MQ-27 electromagnetic scanning equipment consists of a solenoid coil that generates an electromagnetic field parallel to the axis of the coil. The phase angle of



FIGURE 1 MQ-27



the field is deflected as cartons of meat pass through, with the deflections of the phase angle scanned by an on-board computer at a rate of up to 50 measurements per second. This produces a curve of the change in phase angle as the cartons pass through the solenoid.

Parameters that can be measured from the curve and which can be related to the CL contact of the carton are the phase maximum average (PMA) and the area under the curve (Area).

Hot-boned Meat

Problems associated with collecting core samples for CL testing from cartons of boneless chilled meat are exaggerated in the case of hot-boned meat.

When the traditional method of core sampling on the product immediately after packing is used with hot-boned meat, the meat distorts and does not fill the core tube. This means that samples collected from cartons of hot-boned meat are small and not at all

representative of the carton contents. The samples are not reliable for CL estimation.

Some establishments resort to coring cartons after the meat is frozen. This labour-intensive, expensive exercise involves logistical difficulties associated with retrieving a representative group of cartons from the freezer. The MQ-27 equipment is particularly valuable for use with hot-boned meat.

A recent MRC research project investigated the reliability and accuracy of the MQ-27 EMS equipment when used with hot-boned meat, and determined the efficacy of the equipment in overcoming the current problems associated with collecting core samples from hot-boned meat. Works are now using the equipment on hot and warm-boned meat.

Performance of the MQ-27

Research confirms that the MQ-27 electromagnetic scanning unit can provide accurate and repeatable estimates of CL on hot, warm and chilled meat.

Although the readings of the MQ-27 are known to be affected by meat temperature, the range of temperatures encountered in normal production of individual cold, warm or hot-boned meat runs should not upset the predictive accuracy of the MQ-27. However, a separate calibration is required for cold-boned, warm-boned and hot-boned meats and, during production, it takes about three minutes to manually adjust the calibration of the machine. The MQ-27 can be used to automatically predict the CL of cartons of cold-boned and warm or hot-boned meat in the same run if the hot, warm and cold cartons are identified by a barcode before entering the MQ-27. In such cases they can be accurately analysed using the temperature specific equations which are applied automatically.

The accuracy of prediction of CL from the MQ-27 readings can be summed up as follows:

- The MQ-27 estimates the CL of a single carton with an accuracy of $\pm 3\%$ at a 95% level of confidence.
- The MQ-27 estimates the average CL of 30 cartons with an accuracy of $\pm 0.5\%$ at a 95% level of confidence.
- The MQ-27 estimated the average CL of 660 cartons (a container load) with an accuracy of $\pm 0.1\%$ at a 95% level of confidence.

Using the MQ-27

MQ-27 machines should be installed in a room with a reasonably steady temperature; this is not a problem in a boning room.

After installation, the MQ-27 must be calibrated so that readings can be converted into CL values. This involves sampling and testing the CL of about 200 samples and comparing

the results with the machine readings. Each sample used in the calibration is a composite of cores taken from a group of about five cartons. Separate calibrations are needed for hot-boned, warm-boned and cold-boned meat.

The MQ-27 does not make a direct measurement of either fat or lean content. Its measurements must be related to chemical lean. For this reason, a procedure must be maintained to periodically take samples from a few cartons of meat and test for CL to make certain the MQ-27 remains in calibration.

The supplier's calibration, verification and Quality Assurance recommendations should be followed.