

An Armour technician checks meat to see how tender it will be after cooking. Called the Tenderometer, the testing device is a spinoff from a gage originally developed for the Surveyor lunar lander.

system is ninety percent or more—as compared to a range of thirty to fifty percent in conventional equipment.

Tenderness Tester

Space telemetry has been transferred to food processing in the Armour Tenderometer, an instrument that predicts the tenderness of meat. The space component of the instrument is a sensitive, highly reliable strain gage originally produced for NASA's Surveyor lunar lander and other space programs by BLH Electronics, Waltham, Mass.

Several years ago Armour & Co. began to develop a method of testing a hanging carcass to predict how tender the meat would be after cooking; no such method then existed.

After considerable experimentation, Armour came up with a manifold-mounted group of needle-like probes, which when stuck into a carcass, could measure the degree to which the meat resisted penetration. This provided a basis for predicting tenderness, but the development required one more step; a device that could translate meat resistance

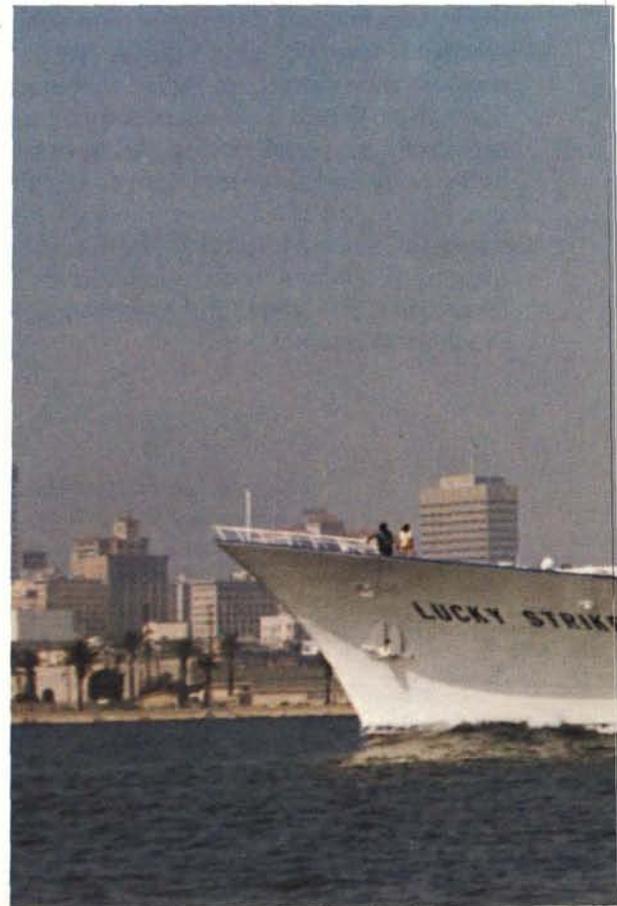
into an electrical readout. Armour found it in the BLH strain gage.

The resulting Tenderometer, now a standard and important part of Armour's meat processing operation, includes a large, 10-pronged fork which is plunged into a carcass and a cable-connected, hand-held electronic device that translates the sensings of the prongs into a tenderness reading on a dial. The instrument is used by Armour to select and guarantee a premium line of beef known as TesTender, whose annual sales run into tens of millions of pounds.

Space Technology for Tuna Boats

The Saturn V booster burns ultra-cold liquefied hydrogen fuel, which must be protected from the intense heat of the launch vehicle's mighty rocket engines. This necessitated development of superefficient insulation to keep the fuel tanks cold. One of two methods used was a spray-on polyurethane foam technique devised by Rockwell International Corp. The technique now has found commercial application as insulation for tuna boats.

Freshly-caught tuna is stored below decks in wells cooled to about zero degrees by brine circulated through a refrigerating system. The wells formerly were insulated by cork or fiberglass, but both



materials were subject to deterioration; cork, for instance, needs replacement every three years.

The Campbell Machine Division of Campbell Industries, San Diego, which manufactures and repairs large boats for the commercial fishing industry, was looking for a better way to insulate tuna storage wells. Learning of the Rockwell technique, Campbell contracted for a test installation on one boat, then bought its own equipment and adopted the spray-foam procedure for their boats.

The foam hardens after application. It not only is a superior insulator, it also is considerably lighter and easier to apply. Fishing industry spokesmen say that foam insulation is far more reliable, efficient and economical than prior techniques. More than 40 foam-insulated tuna boats, ranging in cost from \$1 million to \$4 million, have been built and sold. Principal customers are Ralston Purina's Van Camp Seafood Division and Star-Kist Inc.

Bonded Lubricants

Another spinoff to the food processing industry involves a dry lubricant developed by General Magnaplate Corp. of Linden, N.J. Used in such spacecraft as Apollo, Skylab and Viking, the lubricant is a coating bonded to metal surfaces providing permanent lubrication and corrosion resistance. The coating

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Yellowfin tuna, being unloaded from a tuna boat, arrive at the cannery after transport in a foam-insulated hold. Fishermen say that sprayed-on foam, originally developed to insulate rocket fuel tanks, is superior to other insulation. More than 40 foam-insulated tuna boats—like Lucky Strike—have been built and sold.

