THOUGHTS ON THE PAST PRESENT AND FUTURE OF THE RENDERING INDUSTRY
NZ MEATWORKS 1969-BATCH COOKER
VENT STEAM NOT CONDENSED

Fig. 1: Wasted heat in a meat works.
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Heat Recovery in the Meat Industry

A. K. FLEMING
B.E. (CHEM.)

This paper describes the use of steam and hot water in the meat industry. Surveys have highlighted the nature of the fluctuating demands for these services and the considerable wastage of heat energy that can occur, principally from waste steam vented from rendering cookers. The conservation of heat energy by condensing steam not only provides useful hot water but also has beneficial side effects such as the elimination of odour from rendering fumes, thus making a significant contribution to air pollution control. Data based on experimental tests are presented for the design of suitable heat-recovery and storage plant together with a brief account of plants already installed and operating within the industry.

ALLAN KEITH FLEMING was born at Wellington and gained his degree at Canterbury University. He joined the staff of the Meat Industry Research Institute of New Zealand Inc. in 1961 and is now a research officer with that organisation. Mr Fleming has written several papers on topics associated with the heat treatment of primary meat products and one of these papers was presented at the 12th Congress on Refrigeration, Madrid, 1967.

He is a holder of a Sir Walter Mulholland Fellowship and has been overseas studying for his doctorate under the supervision of G. Lorenzen at Trondheim, Norway.

1. INTRODUCTION

HEAT ENERGY, in the form of process steam, is being consumed in ever-increasing quantities in the meat industry. The results of a steam survey undertaken by Earle indicated that some 450,000 lb of steam would be consumed for a lamb kill of 12,000/day. Today, increases of up to 50% in steam consumption can be expected, principally for additional hot-water supplies to meet new sanitation requirements. In a large works, steam production may exceed 1,000,000 lb/day and cost around $250,000/year. About half the total steam generated was consumed within the rendering department, and up to 80% of the heat content was lost directly to the atmosphere as evaporated water from rendered materials (see Fig 1). This practice resulted not only in gross heat wastage but also in air pollution and depositing of entrained fat particles and meat scraps in the vicinity of the rendering department. Earle suggested that useful hot water could be obtained by condensing this steam. Such a technique could offer beneficial side-effects as well as a relieving boilers frequently overloaded by peak demands in the production of hot water by direct mixing steam with cold water.

2. HOT-WATER SURVEY

The survey was made during a slack period of the year (October, 1963) when the hot-water demand was approximately 70% of the maximum require

Fig. 1: Wasted heat in a meat works.
1974 - 1976 NZ/AUSTRALIA

1. DIGESTORS

2. BATCH COOKERS

3. CONTINUOUS COOKERS

4. CENTRIFLOW

5. CENTRIMEAL

6. PFAUDLER
1974 -1976 NZ/AUSTRALIA

EDIBLE FAT

NZ MARGARINE FAT

INEDIBLE TALLOW

MEAT AND BONEMEAL

DRIED BLOOD
TYPE OF RENDERING 1974-1976

✓ HIGH TEMP ~90%
✓ LOW TEMP ~ 10%
1974 - 1976 NZ/AUSTRALIA

RENDERING R&D

MIRINZ - NORMAN LAW/LESTER DAVEY

CSIRO - LEN HERBERT /DES WALKER

SUPPORTED BY INDUSTRY
1974 -1976 NZ/AUSTRALIA

PROBLEMS :

1. SALMONELLA

2. QUALITY OF PRODUCTS

3. PRODUCTION COSTS – LARGELY UNKNOWN

4. SMELLY/DIRTY PLANTS

5. SIGNIFICANT ENERGY COSTS
MIRINZ RENDERING
SURVEYS 1976 TO 1978

BATCH COOKING

CONTINUOUS DRY RENDERING

CENTRIFLOW

PFAUDLER
REQUIREMENTS

- Eradication of Salmonella
- Sterilization of meals
- Product quality
- Production costs

BEST RENDERING PROCESS??
MIRINZ RENDERING SURVEY 1976-1979 RESULTS

MICROBIOLOGICAL QUALITY

- PRESSURE CYCLE IN BATCH COOKERS DID NOT PRODUCE STERILE MEAL

- IN ALL PLANTS GROWTH OF HEAT RESISTANT BACTERIAL SPORES AND/OR MICROBIOLOGICAL CONTAMINATION OCCURRED AFTER THE MATERIAL LEFT THE COOKERS AND DRYERS
MIRINZ RENDERING SURVEY 1976-1979 RESULTS

- Dry Rendering produced meals with 9% to 13% Fat
- Centrimeal and Pfaudler produced meals with 6% to 7% Fat
- All plants overdried meals below 8%
MIRINZ RENDERING
SURVEYS 1976 TO 1978

Effect of added water on the moisture content of raw material
MIRINZ RENDERING
SURVEYS 1976 TO 1978
STEAM CONSUMPTION KG STEAM/KG WATER EVAP

DRY RENDERING  1.4 TO 1.7

CENTRIMEAL    1.5

PFAUDLER LOW TEMP  1.1
MIRINZ RENDERING SURVEYS 1976 TO 1978

Condensate Loss: 404 (6.1%)
Heat Retained in Product: 292 (4.4%)
Convection Loss: 122 (1.8%)
Vent Gas Condensate Loss: 565 (8.6%)

Heating Input: 6800 (100%)

Recovered in Hot Well: 1226 (18.6%)
Recovered from Vent Gas: 3991 (60.5%)

Heat flow (mJ/cook) of cookers in batch dry rendering plant No. 1. (Average of 57 cooks.)
MIRINZ RENDERING
SURVEYS 1976 TO 1978

PRODUCTION COST BASED ON THE THREE MOST EFFICIENT RENDERING PLANTS – SEPTEMBER 1983

APPROXIMATELY $100/t OF FINISHED PRODUCT
EXCLUDING FREIGHT AND BUILDINGS
MIRINZ RENDERING SURVEYS 1976 TO 1978

NONE OF THE FIVE RENDERING SYSTEMS WAS IDEAL FOR NZ CONDITIONS

MIRINZ DECIDED TO DEVELOP THE MLTR MIRINZ LOW TEMPERATURE RENDERING SYSTEM -1979
SUPPORTER OF MLTR
MIRINZ
Continuous Low Temperature Rendering System

Processes all types of raw material

Produces high quality meal and tallow

Reduces energy costs
Major Shift
To Low
Temperature
Rendering
In Kiwiland

By Frank Burnham

(Editor’s Note—This is the fourth in a continuing series of reports begun in 1983 on new rendering systems being offered in the North American market. The reports are based on actual, on-scene interviews and observations and on desk research and analysis—by the author who are using the particular system.)

The MIRINZ (Meat Industry Research Institute of New Zealand) low temperature rendering system (known as the MLTR), first introduced in 1980, now is in use in 16 of New Zealand’s 53 rendering plants.

In addition to the 16 MIRINZ MLTR systems, eight other plants employ dry continuous systems, eight employ dry continuous systems while two still use the old, digester (pressure cooker) systems.

Recently, RENDER visited six of those 16 plants using the MLTR “kicking the tires” and talking with operators. The plants ranged from that operated by the Auckland Municipal Abattoir which has Jamieon, engineering manager, says “handles the worst of raw materials” to plants handling nothing but “ice cream.”

Included was the first MLTR in New Zealand which now is in its sixth year of operation and a brand new MLTR due to be in operation by the time this issue of RENDER is in the hands of the reader.

The MLTR system, simply described, is based on reducing the raw material to small particles (less than 1/2 inch); cooking (rendering) at temperatures ranging from 187 to 212 degrees F for two to 10 minutes; and mechanically separating the liquid and solid phases. A feature of the patented process, calls for an automated system which topped floor polished tallow to be recycled to the rendering vessel.

In New Zealand, the system appears in two versions. One is the all-new, turnkey plant which includes a patented “batch” oven, a direct-fired rotary dryer called the “Flo-Dry” designed and produced by Pacific Proteins. The other is a retrofit version which permits a batch plant to be converted to continuous MLTR operation. The conversion of the existing batch cookers converted to dryers. This latter configuration permits a renderer to take advantage

of the attributes of the continuous, low temperature system at significant dollar savings.

The MLTR at the Auckland Municipal Abattoir represents a turn-key system including the new-design, direct-fired dryer. The abattoir, owned by the Auckland City Council, custom slaughters 90,500 head of beef, 660,000 head of sheep and 143,000 head of hogs annually. Some 40 percent of the beef and hogs and 50 percent of the sheep represent local graded stock.

Although the abattoir has been in operation since 1911, the large rendering plant was added only last year. Previously, its offal was handled by a “contract renderer” (contract renderers correspond to independent contractors in the United States). The abattoir has operated a small “technical fat” plant since 1978.

R. J. Turnbull, manager of the abattoir, reports that within three to five years the newly constructed MLTR system is expected to “up to full production at 15,000 pounds/hour doing what it is supposed to do.” He indicates he had anticipated about a 23 percent improvement in return with a payback in four years. Unfortunately, he adds “the depressed tallow prices will make that payback more on the order of seven years but, he says, “this still is a viable option.” The increased return, he attributes to the capability of the MLTR system.

Offal without sample contents, he reports, comes out at 0.5 Lovibond with an FFA of three and moisture at 0.1 percent. The plant takes out the “ice cream” for the technical fat plant and leaves the “rubbish” for the MLTR. Blood also is processed through the system. Specifications for fat in meal for the technical fat plant is eight to 10 percent moisture. The abattoir. Turnbull say that on average, the moisture always has been under 10 percent and as low as 5.4 percent. Moisture always is well under 10 percent, he adds.

“I think we bought a system that will give us just what we need,” he tells RENDER.

At the Auckland plant, raw material is dumped into a partitioned bin — soft on one side, hard on the other. Triple screws provide a “blending action” as they move material through a metal detector to a Croviglia pre-breaker and into a surge bin. A weight sensor on the...
A Gentle Giant is Remembered

In 1994, NRA President Burton Levy, right, honored Frank Burnham for his years of dedication and service to the rendering industry.
MLTR PLANT 1987
APPROX 35 MLTR PLANTS WORLDWIDE

PVLP PROTEINS, AUCKLAND 1985

INDIA-SINCE 1995-10 MLTR PLANTS (9 GEL BONE)

MBL, ADELAIDE - 2011

NABL DARWIN - UNDER CONSTRUCTION
MAD COW /BSE 1986

INVISIBLE INDUSTRY CAME UNDER SCRUTINY

REGULATION

BANS ON FEEDING

PUBLIC BECAME AWARE OF RENDERING
CONTRIES AFFECTED BY BSE
EFFECT OF HEAT

+ REQUIRED FOR STERILIZATION

- REDUCE DIGESTIBILITY

- DESTROYS "HEAT LABILE"

AMINO ACIDS SUCH AS LYSINE
HEAT PENETRATION DEPENDS ON:

- Temperature of Cooker or Dryer
- Residence Time
- Pressure
- Particle size
- Nature of raw material
- Agitation
WITH MOISTURE SALMONELLA IS DESTROYED

- AT 82 °C for 7 MTS.
- AT 95 °C for 4-6 MTS. (MIRINZ RV)
SALMONELLA RE-INTRODUCTION

CONTAMINATION

- Dust Particles on walls, floors
- “Wet Product” in Vessels & Screw Conveyors
- Floor pickings
- Rodents, Birds
- Interchange of personnel
- Interchange of tools
- Re-use of bags & container
RENDERING OPERATORS TRAINING WORKSHOPS

1974/1976 MASSEY UNIVERSITY – SAM OLDFIELD

1991 ARA TRAINING WORKSHOPS – BILL POONCER
21 WORKSHOPS OVER 700 ACCREDITED

2011-NZRG
PRESENT STATUS OF RENDERING

REGULATED – GLOBAL GOVERNANCE

SAFE RECYCLING PROCESS

ENERGY EFFICIENT

ENVIRONMENTALLY SUSTAINABLE

MODERN PROCESS
MODERN LOW TEMP RENDERING PLANT AUSTRALIA 2013
FUTURE DEVELOPMENTS
<table>
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<th>MEALS</th>
<th>PROTEIN</th>
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<tr>
<td>MEAT MEAL</td>
<td>&gt; 65%</td>
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<tr>
<td>LIVER MEAL</td>
<td>&gt; 65%</td>
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<tr>
<td>BLOOD MEAL</td>
<td>&gt; 80%</td>
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<tr>
<td>MEAT &amp; BONE MEAL</td>
<td>45% to 50%</td>
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<tr>
<td>OVINE MEAL</td>
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<td>60% to 65%</td>
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<tr>
<td>FEATHER MEAL</td>
<td>80%</td>
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<tr>
<td>BONE MEAL</td>
<td>30% to 35%</td>
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GEL BONE

MEAT AND BONE MEAL (MBM) [HIGH ASH]

GEL BONE

MBM LESS GEL BONE

- Water
- Fat
- Protein
- Ash
- Fibre
PASTRY GEMS
(EDIBLE TALLOW)

SOAP
(INEDIBLE TALLOW)

BONE GEL
(BONE CHIPS)
MEAT AND BONE MEAL

DRIED BLOOD

BLOOD AND BONE GARDEN FERTILISER
COMPARISON OF PROTEIN LEVELS AND VALUES
EDIBLE MLTR PLANT 1986
TALLOW CONVERTED TO BIODIESEL

Raw Tallow

Biodiesel Reaction

Purified Biodiesel
IT HAS BEEN AN INTERESTING 40 YEARS

ENJOYED WORKING IN THE INDUSTRY

WISH YOU ALL WELL FOR THE FUTURE

THANKS FOR YOUR CONSTANT SUPPORT