# WASTE MINIMIZATION DEMONSTRATION PROJECT
# POLISH MEAT INDUSTRIAL SECTOR

## MEAT PLANTS ASSESSMENT REPORT

## PLANTS VISTED

**ELK - FEBRUARY 25, 1994**
**ELBLAG - FEBRUARY 28, 1994**
**OSTROLEKA - MARCH 1, 1994**
**LUKOW - MARCH 2, 1994**

**WORLD ENVIRONMENT CENTER**
**419 PARK AVENUE SOUTH, SUITE 1800**
**NEW YORK, N.Y. 10016**

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J. Taft/USAID/DC
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## I. EXECUTIVE SUMMARY

### Background

During the period February 25 through March 2, 1994, the volunteer consultant Mr. Donald O. Dencker, P.E. in conjunction with Dr. George Laszkiewicz, World Environment Center Project Manager, Central and Eastern Europe made one day assessments of four Polish meat plants. These assessments were used to select two Polish meat plants for participation in Waste Minimization Demonstration Projects.

This report was prepared by Mr. Donald O. Dencker, P.E.

Mr. Dencker, retired Environmental Engineering Manager at Oscar Mayer Foods Corporation had previously made environmental assessments at meat plants in Estonia and Jordan for the World Environment Center (WEC) under cooperative agreement with the United States Agency for International Development (USAID) of Washington, D.C.

The meat plants inspected were those at:

Elk, Poland - February 25, 1994
Elbag, Poland - February 28, 1994
Ostroleka, Poland - March 1, 1994
Lukow, Poland - March 2, 1994

### Findings

As a result of the one day assessments, it was found that all four plants were potential candidates for participation in Waste Minimization Demonstration Projects.

Using selection criteria intended to select the most suitable plants, two plants were selected as the best facilities for demonstration project participation. The selection criteria used singled out plants where the greatest waste minimization could be achieved within the 8 months time frame allowed for the project. The second significant criteria used was the potential for transfer to other plants the lessons learned and examples developed at the participating plants.

Based upon the assessments and their evaluation, the plants selected for participation in Waste Minimization Demonstration Projects were:

Lukow, Poland
Elblag, Poland

Recommendations

It is recommended that the World Environment Center proceed to enter into cooperative agreements with the meat plants - Lukow and Elblag, Poland for the carrying out of Waste Minimization Demonstration Projects.

In order to insure successful implementation of the demonstration projects, it is further recommended that:

1. A competent, United States based consulting engineering firm be employed to provide overall direction of the two demonstration projects.

2. A competent Polish meat industry knowledgeable consultant be employed to provide in-country assistance to the U.S. consultant and to the participating plants.

3. That the volunteer consultant continue to be involved towards successful execution of the projects.

4. That ample time be allowed for work of the U.S. consultant and in-country consultants for successful completion of the projects.

5. That the in-country consultant be available when needed by the U.S. consultant and to the extent needed by this U.S. consultant.

6. That a full time interpreter accompany all U.S. consultants efforts in Poland.

## II. INTRODUCTION

The purpose of the Poland Meat Industry trip was to inspect four candidate plants and from the four, select the most suitable two to participate in Waste Minimization Demonstration Projects. This inspection visit was carried out by Mr. George Laszkiewicz, World Environment Center Project Manager and Mr. Donald O. Dencker, P.E., volunteer consultant. The entire effort is sponsored by the United States Agency for International Development.

The plants visited and the date of each visit were:

Elk, Poland - February 25, 1994
Elblag, Poland - February 28, 1994
Ostroleka, Poland - March 1, 1994
Lukow, Poland - March 2, 1994

At each plant Dr. Laszkiewicz completely explained the purpose of our visit and described the Waste Minimization Demonstration Project effort and objectives. At each plant, technical staff members conducted our tours and provided much relevant information. At the conclusion of each inspection, a review meeting was held with the Plant Director.

Additional information was requested from each plant, but only the Lukow plant provided requested information. This lack of promised information hampered the completion of this report.

## III. Waste Minimization Techniques

Major areas of waste minimization effort in the food industry fall into three broad categories. These are:

1. Water Conservation measures
2. Pollution Prevention practice
3. Recycle and reuse

In the food industry, lost product is by far the heaviest pollutional load. Thus most pollution prevention equates to preventing product loss down the plants drainage systems. This would include recovery as a by product material formerly carried away in the plants wastewater.

Recycle and reuse usually entails a material which formerly was a solid waste. This includes recycling of packaging materials and by product recovery of product waste formerly disposed of in landfills or refuse dumps.

Water Conservation Measurers typically include:

1. Training of workers and management in proper use of water
2. Installation of flow control devices and valves
3. Installation of engineered nozzles
4. Prevention of overflows
5. Purchase and delivery of proper water using equipment
6. Dry cleanup before any hosing
7. Proper cleaning techniques

Pollution Prevention/Product Loss Prevention measures typically include:

1. Keeping the product off the floor and in the process
2. Special drainage or collection systems
3. Dry cleanup before hosing
4. Floor drain solids catch baskets
5. Floor repair to permit effective dry cleanup
6. Providing right tools for workers
7. Providing adequate containers for floor scraps or other "waste" materials
8. Providing and maintaining proper drain grates and screening
9. Worker and management training
10. Process change to reduce waste

Recycle and Reuse typically includes

1. Recycle of container and packaging scraps
2. Utilization of wastewater sludges
3. Expanding by-product markets
4. Secondary uses of wastewaters

To determine the effectiveness and value of any waste minimization effort, a system of measurements, sampling and record keeping must be set-up and fully utilized. This requires getting extensive cost data, including the costs for water and other utilities and the charges for sewerage services. Accurate water flow measurements and wastewater sampling and analysis are other key elements. To measure is to know.

## IV. FINDINGS

The results of each plant inspection are presented in separate sections as follows:

Plant No. 1 Elk
Plant No. 2 Elblag
Plant No. 3 Ostroleka
Plant No. 4 Lukow

### POLAND MEAT PLANT NO.1
### W.P.P.M. ZAKLADY MIESNE IN ELK
### ELK, POLAND, FEBRUARY 25, 1994

Introduction

The meat plant in Elk, Poland was visited on February 25, 1994 by Dr. George Laszkiewicz, WEC Project Manager and Donald O. Dencker, P.E. WEC Consultant.

The facility is a large plant of West German design placed into service in 1974-75. It currently has 1700 employees. The overall condition of the plant was fair with the equipment in fair to good condition.

Plant Operations

The Elk plant has both cattle and pig slaughtering, with much greater capacity than livestock available for slaughter. A comparison of capacity vs. current kill follows:

Elk Slaughtering

| Species | Capacity/hour | Capacity/8hr. day | Current Daily Kill | % of Capacity |
|---|---|---|---|---|
| Cattle | 60 | 480 | 30 to 40 | 8% |
| Pigs | 250 | 2000 | 250 to 500 | 12 to 25% |

Other operations include edible byproducts, inedible rendering, boning, sausage products and some canning. Meat canning used to be a major operation but has significantly decreased. We were assisted in our inspection of the plant by Mr. Dariusz Rosolowski, Production Manager and Mr. Zbignien Leszkiewicz, Environmental specialist. Prior to departure, we had a review meeting with the plant Director Jarzy Gasiewski. At the exit meeting, the Director appeared to be quite interested in participating in the waste minimization project. The production manager was very helpful and interested in waste minimization.

Water Supply and Wastewater Pretreatment

The Elk plant is supplied with portable water from 4 wells owned by the plant. Water is treated in the on-site water plant in pressure filters for iron removal and clarification.

A complete wastewater pretreatment facility has been installed. A crew of 7 men is employed in the operation of wastewater pretreatment. Use of parts of the facility have been discontinued as they "didn't Work." Pretreatment consists of a combination of subprocesses including rotary screening, chemically enhanced flotation, settling and aeration.

Water Conservation and Waste Minimization/Pollution Prevention

According to the Environmental Specialist, the major problem at Elk was "too much water used." Commendable water use and conserving practices observed were:

1. Shut-off valves installed at the end of most cleanup hoses
2. Not too many leaks observed after end of production shutdown
3. Foot valves installed on most sinks.

Undesirable water use practices observed were:

1. Nozzles not provided on ends of hoses
2. Hoses used for product washing did not have nozzles or shut-off valves
3. During production delays water continued to run in many instances
4. Ineffective, drilled pipe sprays were noted

With respect to product waste minimization and pollution prevention, our limited observations follow:
Commendable Pollution Prevention Practices:

1. The majority of the blood was collected and utilized
2. Middle management aware of need to prevent product waste
3. Wastewater pretreatment reasonably effective

Undesirable Pollution Causing Practices:

1. Poor floor condition makes dry cleanup difficult
2. Too much blood lost to sewer
3. Floor drain grates sometimes missing
4. No catch baskets in floor drains

General Observations

The Elk plant would be a very difficult plant in which to make a high percentage (greater than 15%) water use savings due to a large underutilization of its capacity. This is because about 70% of excess water use is due to under utilization and 30% or less due to inadequate equipment or outright wastage. Thus if outright waste and poor equipment loss is cut 1/3, only a 10% saving is achieved overall.

Arrival of livestock should be improved so that supply failures do not cause line stoppages and water wastage during pauses.

If increased livestock supply cannot be achieved, crew consolidation is a must. Further, killing only one species a day would decrease cleanup and save water.

**POLAND MEAT PLANT No.2**
**ZAKLADY MIESNE W. ELBLAGU P.P.**
**ELBLAG, POLAND, FEBRUARY 28, 1994**

Introduction

The meat plant in Elblag, Poland is an old plant which started operations in 1892. Over the years, the plant has been expanded and remodeled and equipment replaced. The newest portion is the oil fired boiler plant recently completed and placed into service as a result of environmental concerns expressed by the City of Elblag. Building age on the average is 40 years.

The facility is a medium sized plant and currently has 500 employees, many of whom are "bureaucrats."

The overall condition of the plant and equipment was fair to poor. Of concern is the Ammonia refrigeration system which was shut down and in need of repairs. (Winter cold temperature was being used for refrigeration).

Plant Operations

The Elblag plant has both cattle and pig slaughtering. Capacity is much greater than livestock available for slaughter. A comparison of capacity vs. current kill follows:

Elblag Slaughtering

| Species | Capacity/hour | Capacity/8hr. day | Current Daily Kill | % of Capacity |
|---|---|---|---|---|
| Cattle | 35 | 280 | 50 | 17.8% |
| Pigs | 80 | 640 | 150 | 23.4% |

Other operations included edible byproducts, inedible rendering, boning, processed meats, but no canning. Hog hides were being removed for processing at a tannery.

We were assisted in our plant inspections by Mr. Roman Lupinski, Head Maintenance Specialist; Mr. Jerzy Karpinski, General Director and the Production Manager. A representative of the local environmental authority was also present during part of our visit. A concluding meeting was held with the General Director during which interest was expressed in participation in the waste minimization program.

Water Supply and Wastewater Pretreatment

Water is obtained from the City of Elblag, and is metered into the plant. Quality of the City water is poor and the plant further treats the water through two pressure filters. Records of daily water use were promised but not obtained.

Reportedly, the city has a new wastewater treatment plant with ample capacity, hence no strength limits on meat plant effluent.

Wastewater pretreatment is minimal with some screening and a gravity catch basin. Reportedly, solids are removed from the catch basin regularity. Wastewater volume is assumed to be water in volume.

Environmental Concerns

The environmental authority individual expressed the following environmental concerns:

1. Odor problems from smoking meats and inedible rendering
2. Solid wastes and their disposal, such as hog hair and sludges
3. Possible release of ammonia from plant refrigeration system

Water Conservation and Wastes Minimization/Pollution Prevention

It was conceded that the plant is wasting too much water.
Commendable water use and conserving practice observed were: none

Undesirable Water Use Practices Observed Were:

1. Workers did not appear aware of any need to save water
2. Cleanup hoses did not have end of hose nozzles or shut-off valves. ( 1 exception)
3. Hoses used for product washing did not have nozzles or shut-off valves
4. Sinks did not have foot operated or other shut-off valves
5. Ineffective, drilled pipe sprays were used
6. Some leakage observed

With respect to product waste minimization and pollution prevention, our limited observation follow:

Commendable Pollution Prevention Practices:

1. The majority of the blood was collected and utilized

Undesirable Pollution Causing Practices:

1. Poor floor condition in many areas makes dry cleanup difficult
2. Too much blood lost to the sewer
3. Workers flushing product on floor down the drains
4. Too much product on the floor
5. No catch baskets in floor drains

General Observations

Like the Elk plant (Plant No. 1), the Elblag plant is greatly underutilized as to its slaughtering capacity. Also like Elk, a significant amount of water use can be attributed to underutilization. However, at Elblag water wastage due to improper worker practices, lack of water conserving equipment and leakage is significant. A good waste minimization program, including worker retraining and reequipping should be able to save a considerable amount of water.

Savings in product lost to the sewer can also be achieved through worker retraining, providing needed equipment and repositioning. For these reasons a waste minimization program at Elblag is feasible.

**POLAND MEAT PLANT NO. 3**
**ZAKLADY MIESNE OSTROLEKA, S.A.**
**OSTROLEKA, POLAND, MARCH 1, 1994**

INTRODUCTION

The meat plant in Ostroleka, Poland is a very large plant which was placed into service in 1974. It was visited on March 1, 1994 by Dr. George Laszkiewicz, WEC Project Manager and Donald O. Dencker, WEC Consultant.

The design was by the Polish Meat Institute in Warsaw and was part of a central plan where animal slaughtering was to be carried out in large plants, with manufacturing split between the large plants an the many very small plants. This plant now has 1900 employees of whom 700 work in production and 200 in maintenance.

It is planned to combine the two slaughtering crews into one crew, dropping 300 employees. The Ostroleka plant and its equipment are in fair to good condition.

Plant Operations

Like the other plants visited, the Ostroleka plant which slaughters both cattle and pigs has a much greater capacity than livestock availability. A comparison of capacity vs. current kill follows:

| Species | Capacity/hours | Capacity/8hr. day | Current Daily Kill | % of Capacity |
|---|---|---|---|---|
| Cattle | 45 | 360 | 30 | 8.3% |
| Pigs | 240 | 1920 | 500 | 26.1% |

Other operations include edible by-products, inedible rendering, boning, sausage manufacture, hams and canning. It was stated that overall, the plant was operating at 1/3 of its capacity.

We were assisted in our inspection of the plant by Mr. Kazimierz Kaminski, Production Director; Mr. Andrzej Jagielski, Technical Bureau Manager and Ms. Maria Sochocko, Environmental Specialist. At the start of our visit and prior to departure we had meetings with plant Director Andrzej Sochocki which were quite informative. Interest was exposed in participation in the waste minimization program as a participating plant.

Water Supply and Wastewater Pretreatment

Water supply for the plant came from eight wells owned by the facility. Current water use was stated to be 2,000$m^3$/day average to 2,500$m^3$/day maximum. Total water supply capability was stated as 9,300$m_3$/day with ability to supply water to the city, but never utilized. There was a complete water treatment plant on-site employing aeration, filtration and chlorination which was operated by a staff of 9.

Complete wastewater pretreatment was provided on-site in a newly installed facility of Dutch design and manufacture. Pretreatment employed included 3 satelite bar screen and hydrasive screening stations which pumped to the pretreatment plant where the combined wastewater was fine screened by rotostrainers followed by chemically enhanced dissolved air flotation. The problem appeared to be utilization of the floated material and the centrifuge dewatering of the sludge. A wastewater analysis laboratory was on-site. Design capability was 2500 $m^3$/day and the operating staff totaled 8 people.

Wastewater pretreatment is shown schematically on Figure 1.

Stream for the plant came from a central heating station.

Water Conservation and Wastes Minimization/Pollution Prevention

The Plant Director was pleased with the fact that the Ostroleka plant when compared with two other Polish plants used the least water per ton of edible product produced. The other two plants were Elk and Lubin.

Commendable water use and conserving practices observed were:

1. Most wash sinks had foot valves
2. Pig kill wash cabinet had nozzle equipped sprays
3. There appeared to be some effort to restrict water use

Undesirable Water Use Practices Observed

1. Water use in pig scalding tank was excessive
2. Cleanup hoses did not have end mounted shut-off valve or nozzles
3. During pig slaughtering production interruptions, much of the water sprays and sluicing streams continued to run.

With respect to product waste minimization and pollution prevention, our limited observations follow:
Commendable Pollution Prevention Practices:

1. Much of the blood collected and utilized
2. Wastewater pretreatment was effective
3. Drain catch baskets were in place in many of the floor drains
4. A grease floating and collection tank is in place alongside the hog casing stripper/washer. Skimmering collected are rendered in open jacketed coolers in same room
5. Product catch pans were used at conveyor ends in boning

Undesirable Pollution Causing Practices:

1. Blood collection is poor in pig kill and much blood is ending up on the floor
2. Too much product on the floor in some areas.

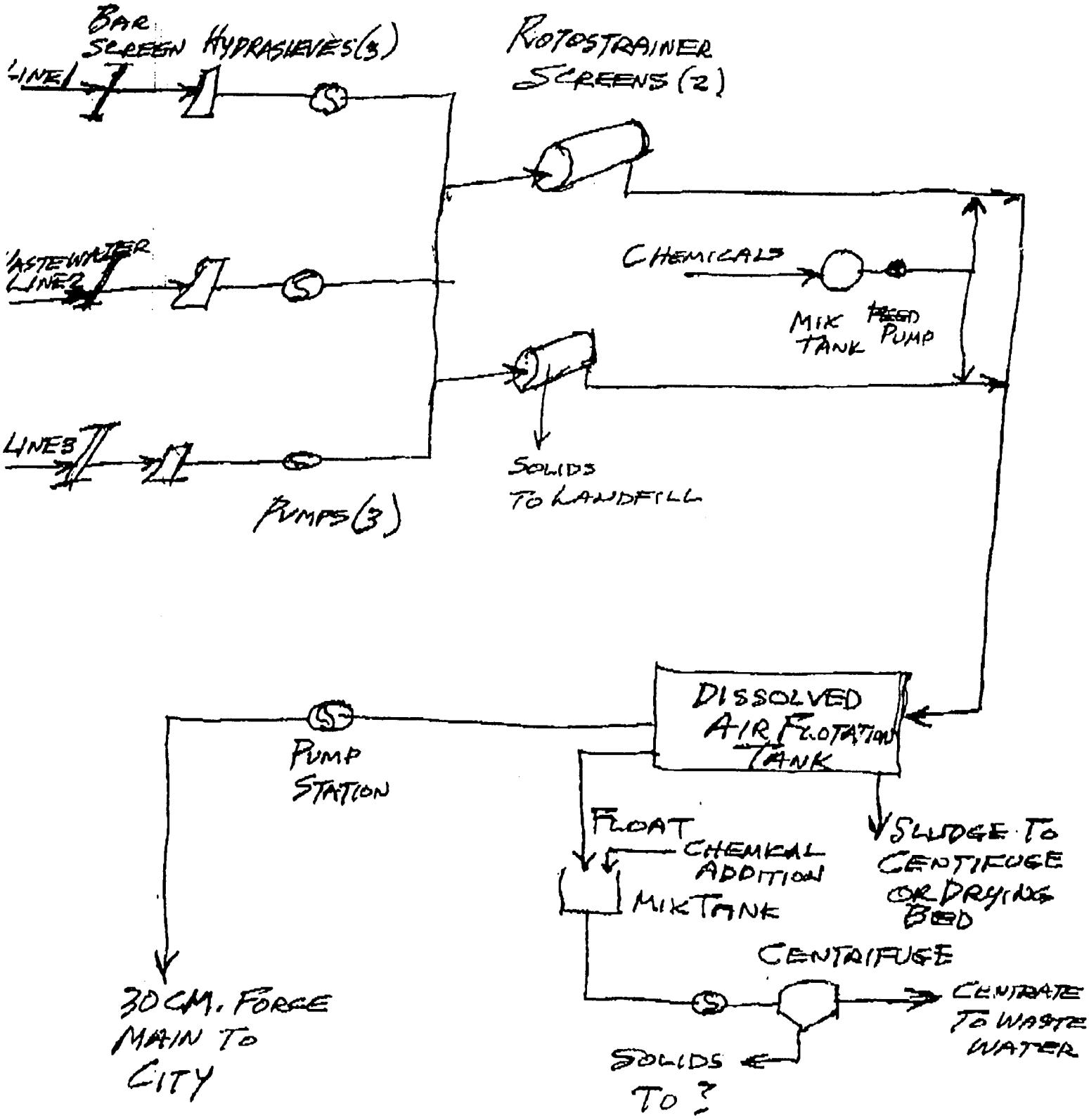
General Observations

Like the other plants, the Ostroleka plant is greatly hampered by under utilization. It was noted that erratic delivery of pigs caused line stoppages during which water was wasted. On the positive side, plant management has done a good job of upgrading some areas of the plant and in providing some new equipment. Overall condition of plant and equipment is fair to good.

A big problem facing the plant is the deteriorated condition of the 30cm. diameter, 6km. long pressure sewer line to the city treatment plant. No money is available for the replacement of this line where intermittent breaks are causing plant shutdowns.

Figure 1

# Ostrolebka Wastewater Pretreatment Schematic



**POLAND MEAT PLANT NO. 4**
**ZAKLADY MIESNE W. LUKOWE**
**LUKOW, POLAND, MARCH 2, 1994**

INTRODUCTION

The meat plant in Lukow, Poland was visited on March 2, 1994 by Dr. George Laszkiewicz, WEC Project Manager and Donald O. Dencker, WEC Consultant.

The Lukow facility is a very large plant with a building floor area of 6 hectares which is 645,820 square feet. The plant was completed in 1973 and placed into service in 1974. The establishment currently has 2,030 employees, of which 1,830 are at the plant.

Overall the plant and its equipment were in fair to good condition.

Plant Operations

The Lukow plant has both cattle and pig slaughtering with considerably greater operational capacity than livestock available for slaughter. A comparison of capacity vs. current kill follows:

Lukow Slaughtering

| Species | Capacity/hr | Capacity/8 hr. day | Current Daily Kill | % of Capacity |
|---|---|---|---|---|
| Cattle | 44 | 350 | 100 | 28.6% |
| Pigs | 250 | 2000 | 1000 | 50.0% |

The livestock supply for the Lukow plant appears to be considerably better than the other three plants visited.

Other operations include edible byproducts, inedible rendering, boning, sausage products, meat loafs and meat canning. Canning, including packing in glass containers, continues to be a major operation.

We were assisted in our inspection of the plant by Mr. Antoni Galka, Technical Director; Mr. Andrzej Skowronski, Production Manager; Mr. Jerzy Zurawski, Energy Department Manager; and Mr. Czeslaw Krzywicki, Environmental Specialist. Prior to departure we had a review meeting with the plant director, Mr. Miroslaw Kursa. At this meeting the director and members of his staff showed much interests in proceeding with the described waste minimization program.

Water Supply and Wastewater Pretreatment

The Lukow plant has four wells which supply the needs of the plant plus some is sold to another plant. Well and treatment capacity is 6,000$m_3$/day while current use is 3,000$m^3$/day. Potable water treatment consists of aeration, iron removal sand filtration and chlorination.

A schematic diagram of the plant potable water supply is shown on Figure 1.

The plant has extensive wastewater pretreatment consisting of screening, 1st stage dissolved air flotation and 2nd stage chemically enhanced dissolved air flotation. Skimmings from the first stage flotation are brought to inedible for rendering.

A schematic diagram of the wastewater pretreatment process is shown on Figure 2.

The city of Lukow requires that their pretreated wastewater meet or better the following strength values:

| | |
|---|---|
| $BOD_5$ | 700mg/l |
| COD | 1000mg/l |
| Total Dissolved Solids | 1150mg/l |
| Suspended Solids | 330mg/l |
| FOG (fat, oil & grease | 50mg/l |
| Chlorides | 400mg/l |
| pH | 6.5 to 9.0 |

A single wastewater analysis indicated they were slightly exceeding the TDS and Chlorides limits.

Total daily water use was indicated as 3000$m^3$/production day with wastewater volume being computed as 93.1% of water produced.

Water Conservation Waste Minimization/Pollution Prevention

According to the plant staff who escorted us, major pollution and water conservation problems are:

1. Canning Autoclaves use too much water, 350$m^3$ to 500$m^3$/day
2. Chlorides in wastewater; have 1 year to reduce chloride content
3. Need to increase effectiveness of dissolved air flotation process
4. Excess water use, generally
5. Smokehouse emissions
6. Sand in wastewater sludge

7. Dewatering, removing excess water from wastewater sludges

8. Inedible odors (want to sell inedible rendering plant)

Commendable water use and conserving practices observed were:

1. On pig kill line, shower ahead of final carcass to cooler shower shut-off. (Found not needed).

2. Can wash water reused in plastic tote box washer

3. An pig kill line, final shower conveyor operated as needed

Undesirable Water Use Practices Observed were:

1. Most water sprays were drilled pipe sprays, no nozzles

2. Cleanup hoses did not have end of hose shut-off valves or nozzles

3. Little control of water use in many production areas

With respect to product waste minimization and pollution prevention, our limited observations follow:

Commendable Pollution Prevention Practices:

1. Using bedding in pig holding pens to soak up manure and reduce pollutant discharge

2. The majority of the blood was collected and utilized

3. Management aware of the need to prevent product waste

4. Wastewater pretreatment appeared to be reasonably effective

5. Dissolved air flotation skimmings sent to inedible rending

6. Ammonia refrigeration plant appeared to be very well maintained

Undesirable Pollution Causing Practices:

1. To much product falling to the floor

2. Poor floor condition in some areas makes good dry cleanup difficult

3. Too much blood lost to the sewer

4. Few catch baskets in floor drain castings

General Observations:

It appeared that the Lukow plant has shown a good deal of initiative in approaching pollution causing problems. For example, innovative approaches were being tried as follows:

1. Trying improvised separator to remove sand and grit from wastewater sludge

2. Experimenting with controlling smokehouse emission with chemically treated water spray

3. Testing different polymers to increase chemically enhanced dissolved air flotation efficiency.

The technical ability of the staff appears to be quite adequate for implementing a waste minimization program. In addition a laboratory is on-site for wastewater sample analysis. This laboratory should be provided with COD test equipment to implement a waste minimization project.

Also, since a better kill capacity utilization is achieved at Lukow, water use savings should be a greater percentage of total flow.

## V. SELECTION OF WASTE MINIMIZATION PROJECT PLANTS

It was determined prior to the consultants visit that two of the four plants visited would be selected to be Waste Minimization Project Plants. At the two selected plants, the World Environment Center, acting for the U.S. Agency for International Development, would implement Waste Minimization Demonstration Projects. Each Project would be a cooperative effort between the participating plant, a WEC staff member, a volunteer consultant, a paid consulting engineer from the United States and a Polish consultant. The duration of each demonstration project is projected at eight months.

It was apparent that each of the four plants visited presented waste minimization opportunities. All four plants visited were carefully considered because each expressed an interest in being selected as project plants.

A number of criteria were used in selecting the two project meat plants in Poland. The plants were rated for each criteria, 1 to 4 with 1 being the best or highest score criteria used were:

A. Categories where a high score is best
   1. Overall Plant condition
   2. Condition of floors and drains
   3. Management interest in project
   4. Technical support capability
   5. Wastewater sample analysis capability
   6. Livestock supply
   7. Data and record keeping resources
   8. Use of innovative approaches

Since the Waste Minimization Demonstration Project is of a short 8 months duration, with emphasis on low-cost water conserving and waste reduction measures and since no significant capital funds are allocated to the project; the plants selected should be in reasonably good condition to facilitate such waste minimization activities as dry cleanup and blood collection. This is the reason a high score is desirable for categories 1 and 2.

B. Two other categories rated are:

9. Current water conservation effort
10. Current waste minimization effort

For these two categories a high score is desirable. This is because an objective of the demonstration project is to show significant, immediate savings prior to the end of the projects 8 month duration.

A ranking tabulation for the four plants visited follows:

## GROUP A. PLANT RANKING (LOW SCORE DESIRABLE)
### Score By Plant

| Rating Category | No. 1 Elk | No. 2 Elblag | No. 3 Ostroleka | No. 4 Lukow |
|---|---|---|---|---|
| 1. Overall Plant Condition | 3 | 4 | 1 | 2 |
| 2. Floor & Drain Condition | 4 | 3 | 2 | 1 |
| 3. Management Interest | 3 | 2 | 4 | 1 |
| 4. Technical Support Capacity | 4 | 3 | 1 | 2 |
| 5. WW sample Analysis Capacity | 3 | 4 | 1 | 2 |
| 6. Livestock Supply | 4 | 2 | 3 | 1 |
| 7. Innovative approach use | 4 | 3 | 2 | 1 |
| 8, Data & Record Keeping Resources | 4 | 3 | 2 | 1 |
| Ave. Category 1-8 | 3.6 | 3.0 | 2.0 | 1.4 |

Using these somewhat subjective rating, it would appear that the plants which should be selected are the quite similar large plants at Lukow and Ostroleka.

Further evaluation, considering the last two factors produced the following result:

**GROUP B. PLANT RANKING (HIGH SCORE DESIRABLE)**

| Rating Category | No. 1 Elk | No. 2 Elblag | No. 3 Ostrolaka | No. 4 Lukow |
|---|---|---|---|---|
| 9. Current Water Conservation Effort | 3 | 4 | 1 | 2 |
| 10. Current Waste Minimization Effort | 3 | 4 | 1 | 2 |
| Ave. Category 9 & 10 | 3 | 4 | 1 | 2 |

Note: Low score is best effort

Since the project objective is to achieve significant results in a short, 8 months time frame, the plants to be selected, based upon categories 8 and 9, should be the highest scorers; namely:

Elblag
Elk

Considering all factors, the one certain plant for selection is Lukow, while Ostroleka and Elblag are the second most worthy candidates.

The concluding factor, resulting in the selection of Elblag is that the Lukow and Ostroleka plants are both very large, very similar plants. For this reason it is recommended that the smaller and older plant at Elblag be selected.

The lessons learned through the project at Lukow should be transferrable to Ostroleka at a later date. In summary, Waste Minimization Demonstration Projects should be conducted at the Lukow and Elblag plants in Poland.

## VI: RECOMMENDATIONS

Several specific recommendations emerge from the plant inspections, evaluation of information received and the preparations to implement Waste Minimization Demonstration Projects at two Polish meat plants. The recommendations are:

1. The one day plant visits are an adequate means of selecting plants for Waste Minimization Demonstration Projects.

2. More intensive in-country follow-up is needed to get information promised to the volunteer consultant but never delivered.

3. Adequate time must be allowed for services of the United States paid consultant to successfully carry out the demonstrations projects. (This is considerably more time than the very insufficient 40 to 45 hours promised for the two selected plants).

4. Intensive follow-up by the in-country consultant will be required during the course of the demonstration project.

5. The in-country consultant must be properly trained and have adequate time available for the demonstration projects when needed.

Figure 1

# LUKOW PLANT WATER SUPPLY SCHEMATIC

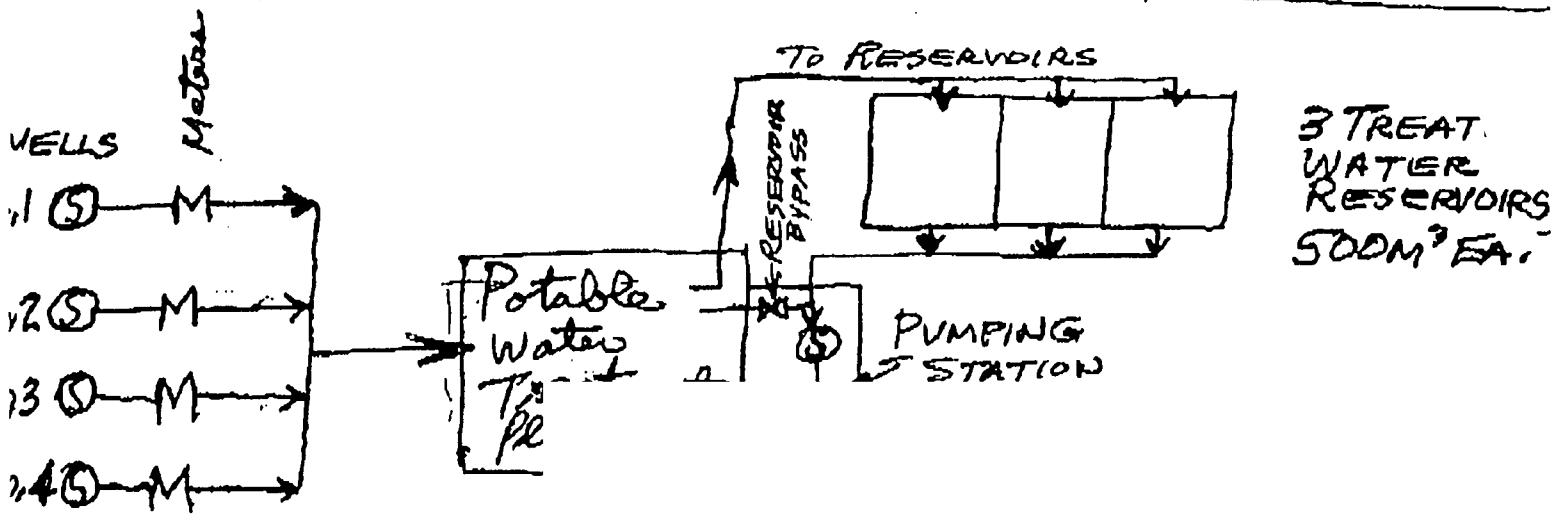
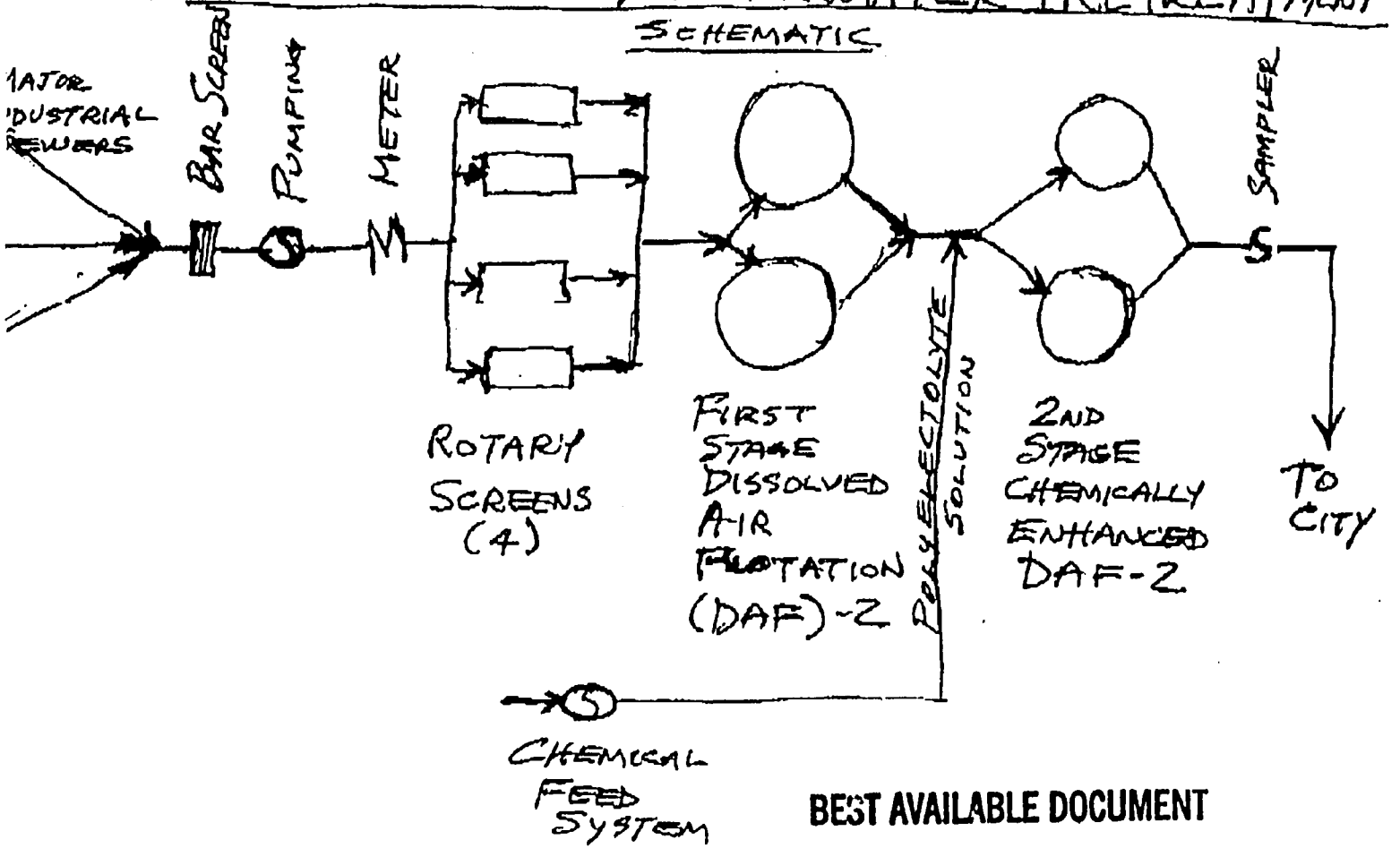



Figure 2

# LUKOW PLANT WASTEWATER PRETREATMENT SCHEMATIC



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B. ITINERARY
C. PERSONS AND ORGANIZATIONS VISITED
D. BUSINESS CARDS OF PERSONS CONTACTED
E. CURRICULUM VITAE OF MISSION EXPERT

## APPENDIX A

POLISH MEAT PLANT PHOTOGRAPHS

1. ELK
2. ELBLAG
3. OSTROLEKA
4. LUKOW

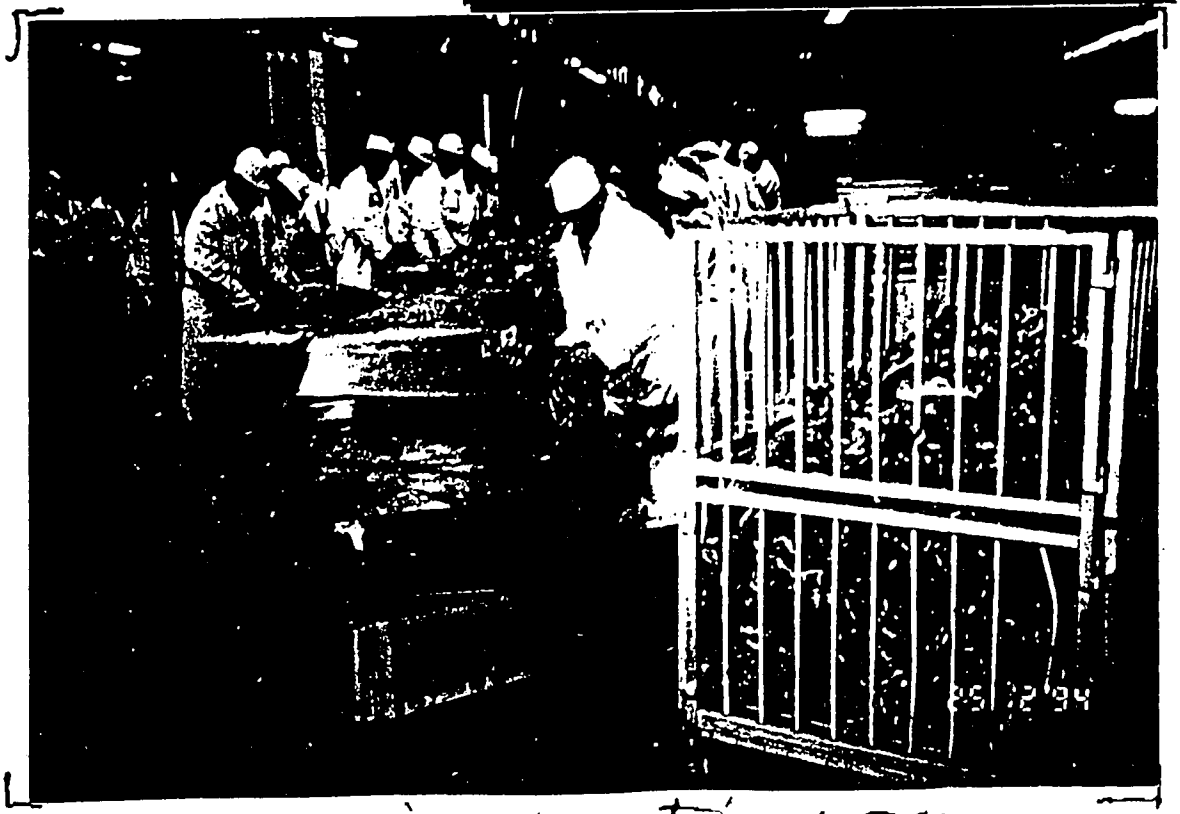
A-1,1 View of Elk Plant on Right and Administrative Building



A-1,2 Typical Plant Corridor at Elk, Poland

A-2,1 Elk, Poland
Mr. Dariusz Rozlowski,
Production Manager,
Dr. Hanga Jaszkiewicz
and Rendering Foreman

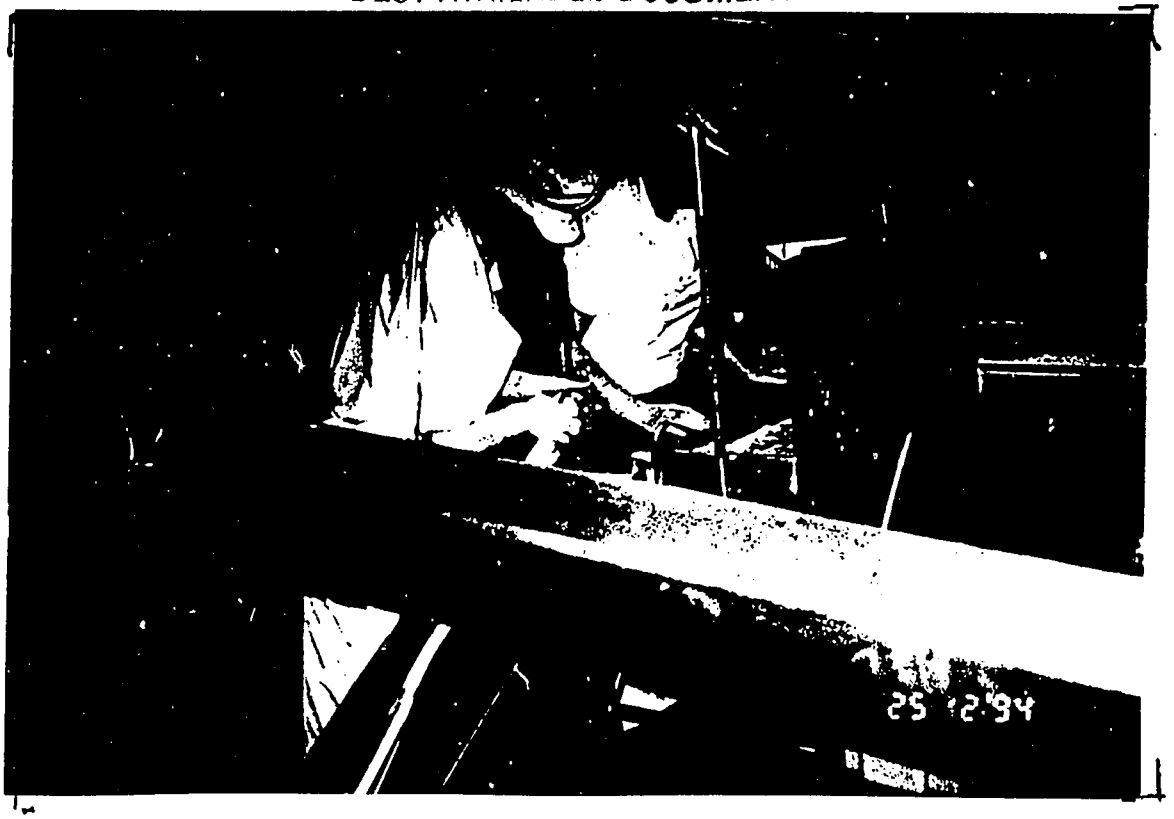
BEST AVAILABLE DOCUMENT



A-2,2 Boning Operation at Elk


A-3.1 Pig Slaughter Blood Collection Trough at Elk



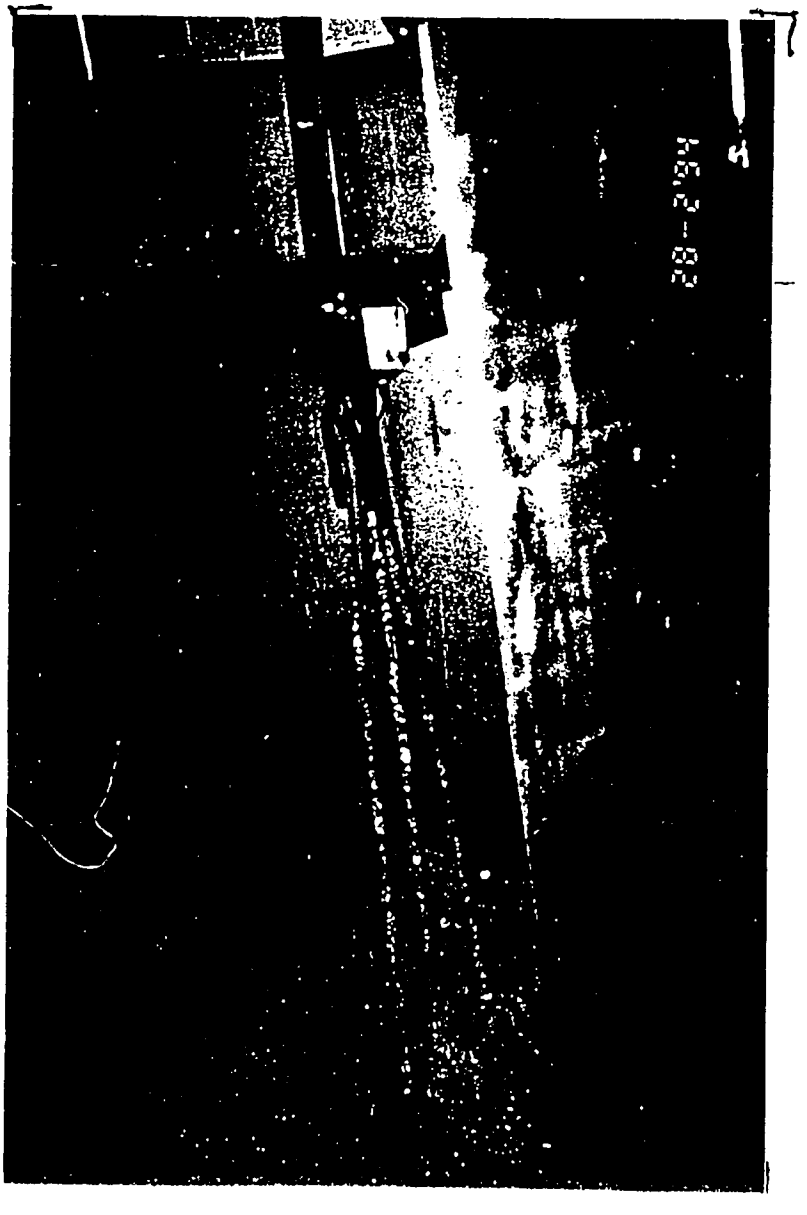



A-3.2 Typical Uncontrolled Product Washing Hose at Elk


A-4.1 Pig Holding Pen at Elblag


A-4.2 Elblag
Edible Blood Removal
from Pig.

A-5,1 Cattle Kill Blood Collection at Elbag

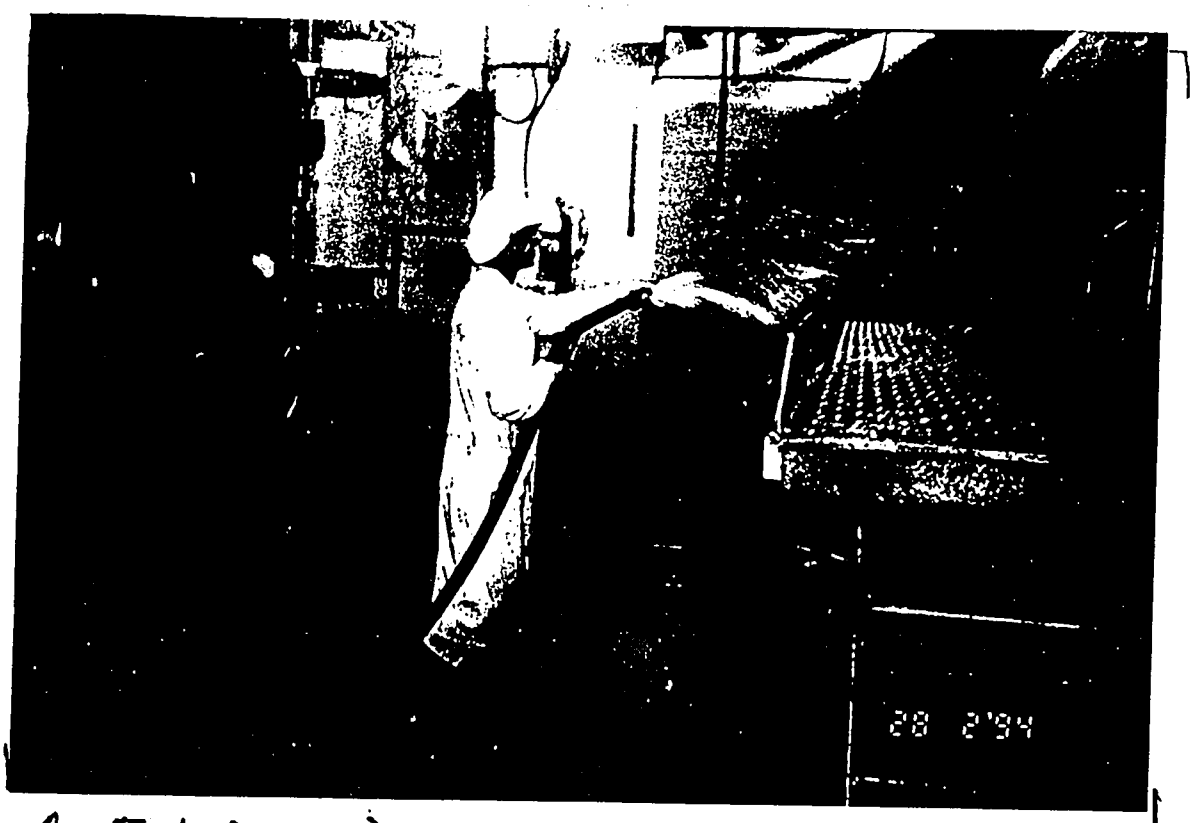


A-5,2 Elbag
Uncontrolled Cattle
Head Wash Spray

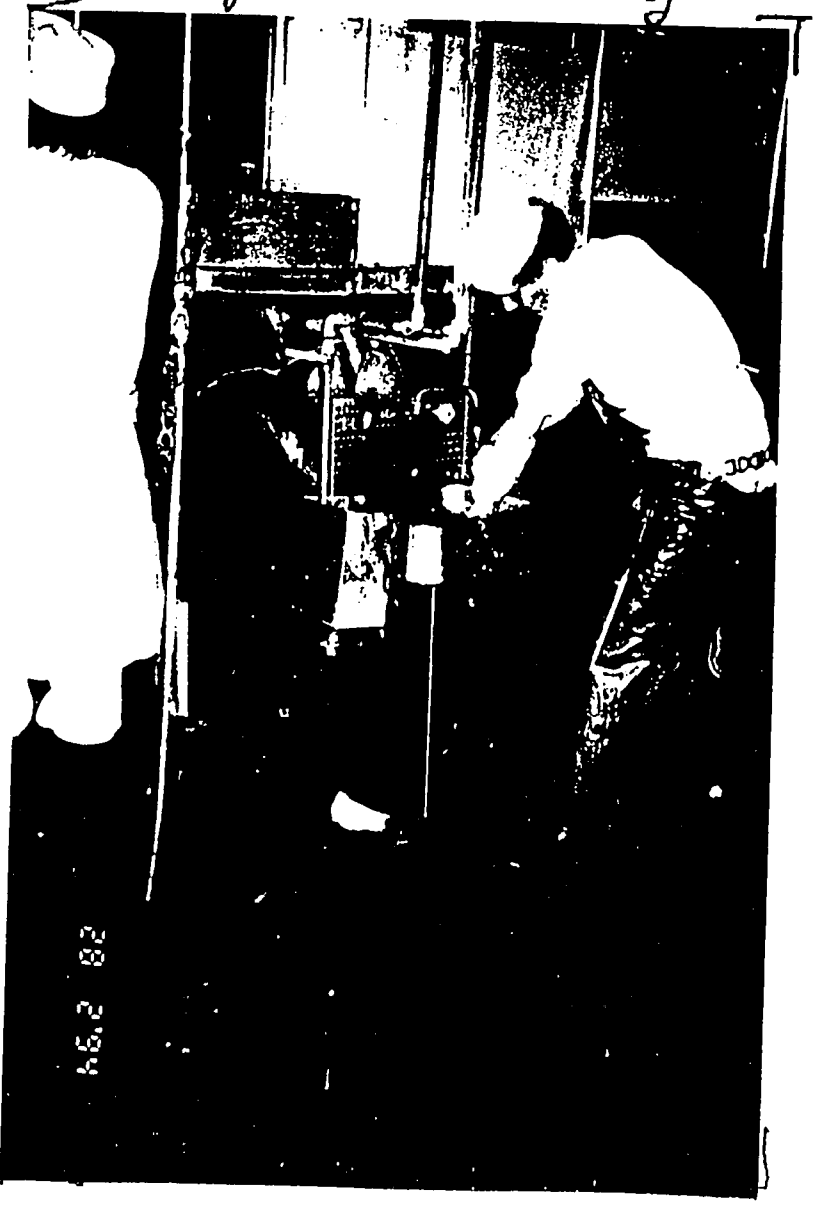
BEST AVAILABLE DOCUMENT

A-6,1 Sausage Department Chopper at Elbl

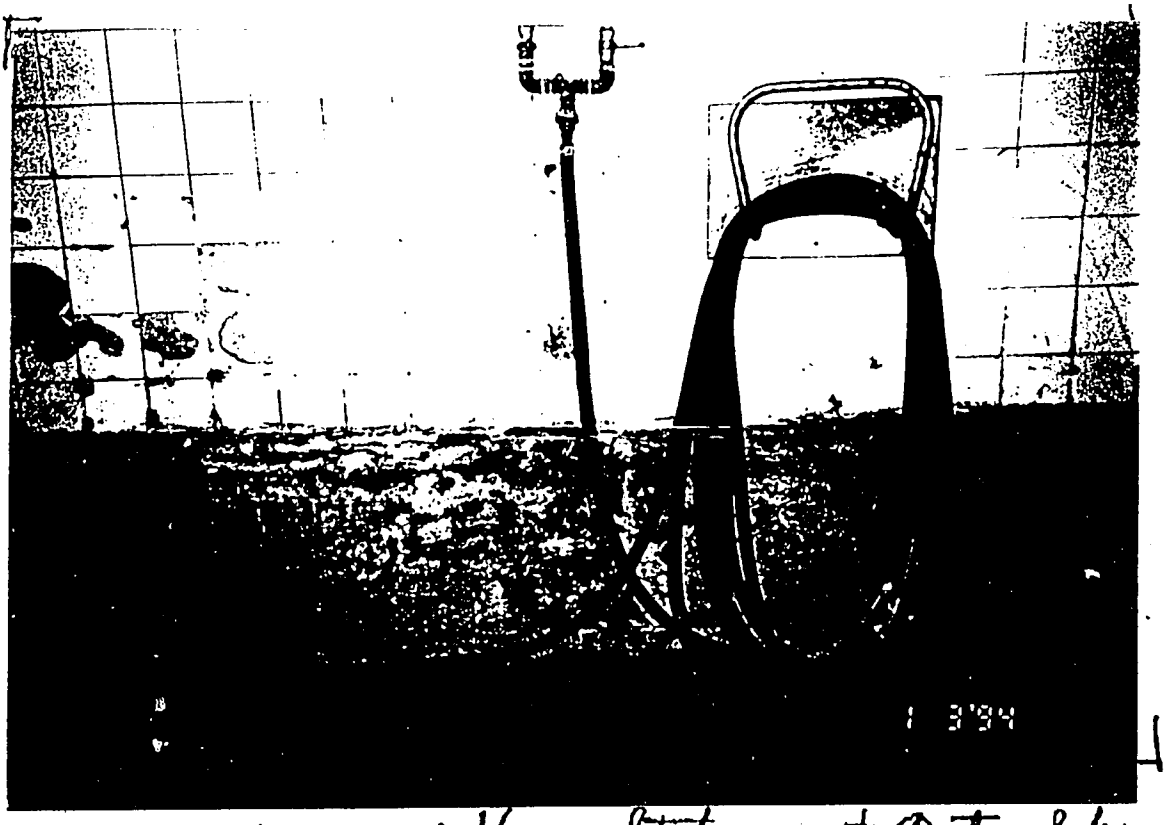
A-6.2 Uncontrolled Flushing Hose at Elbl



A-7.1 Typical Cleanup Hose at Elblag

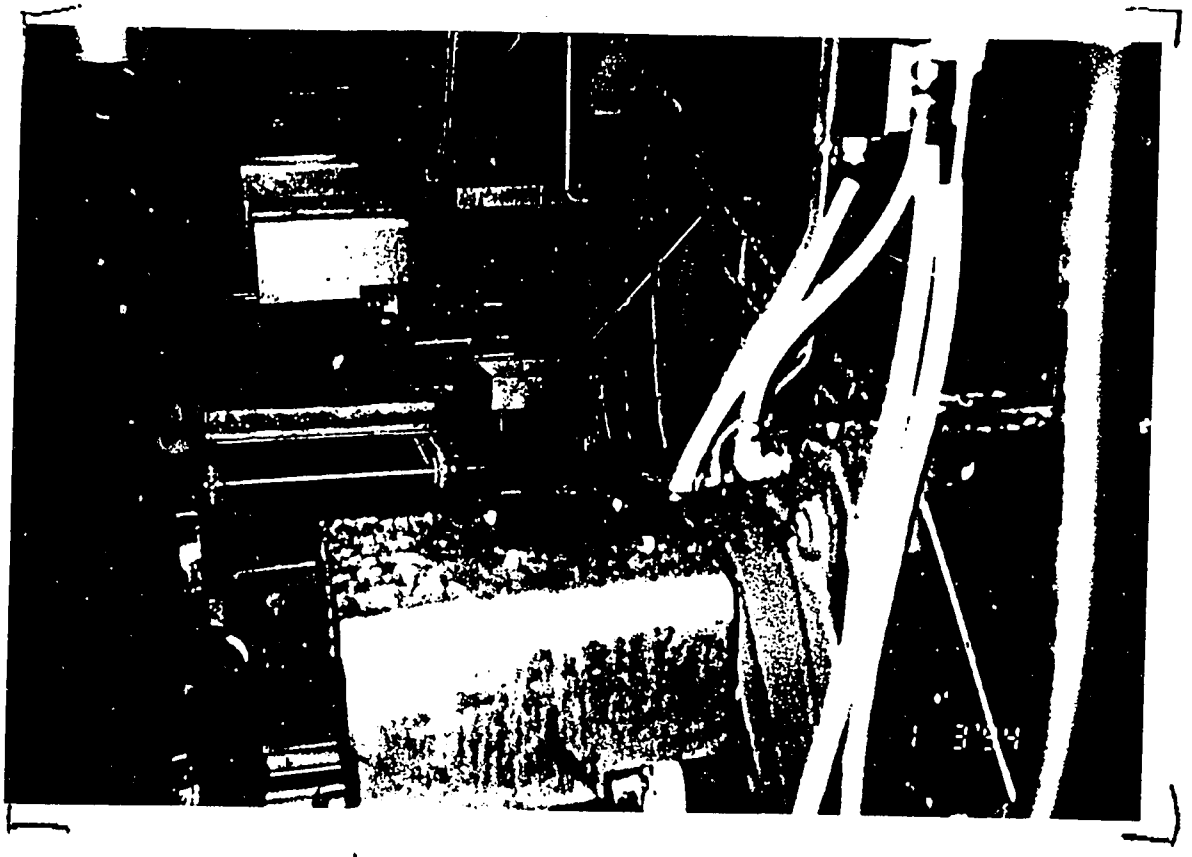


A-7.2 Elblag Typical Hand Wash Sink

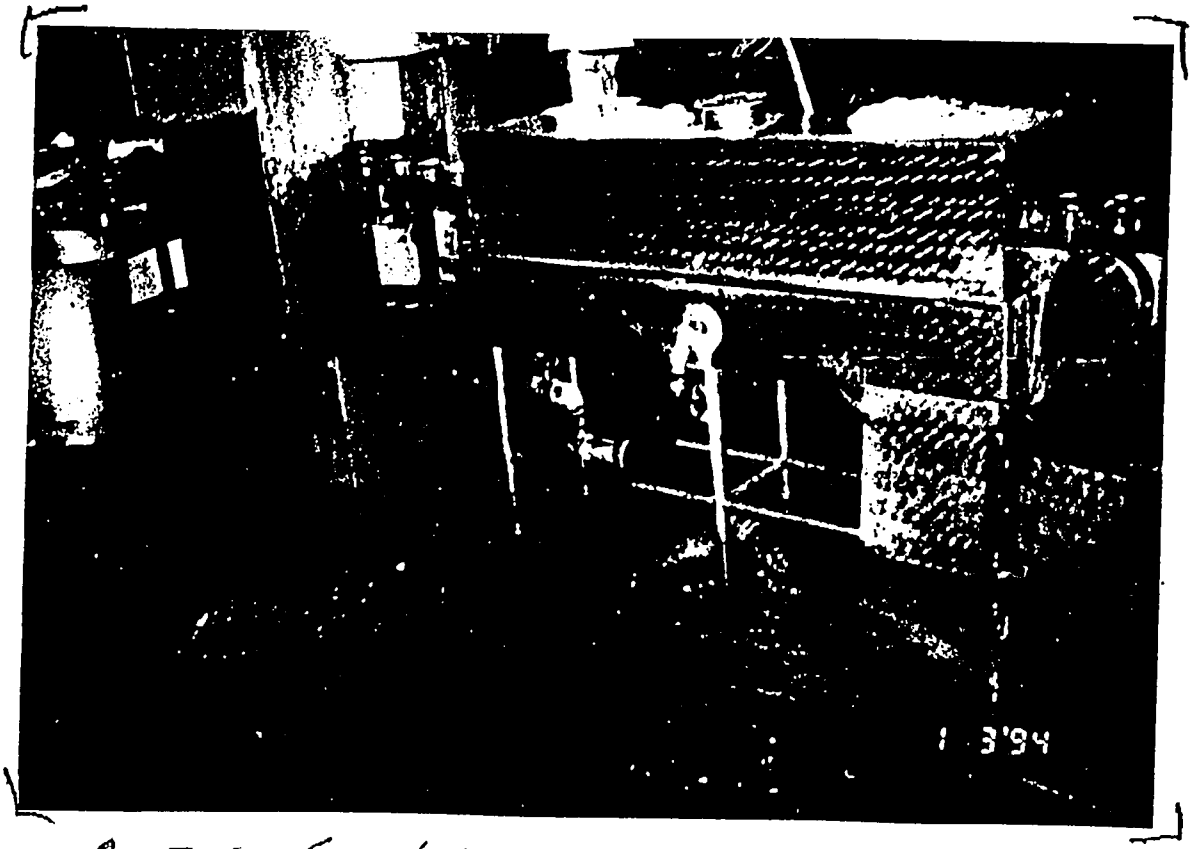



A-8.1 Typical Hose Station at Ostrolaka


A-8.2 Pig Kill floor Cleanup - Ostrolaka



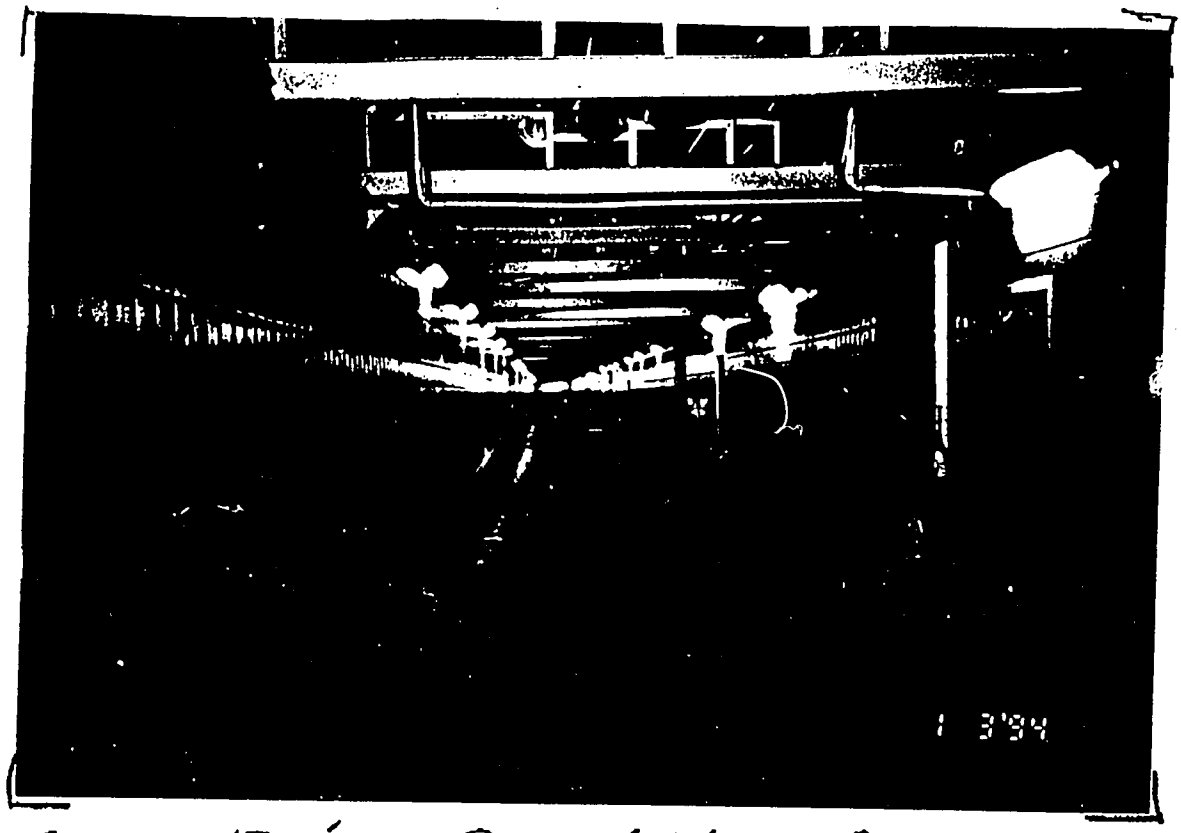
A-9.1 Mechanized Skimmers (On Left) Adjacent to Pig Cooling Cleaner at Ostrolaba



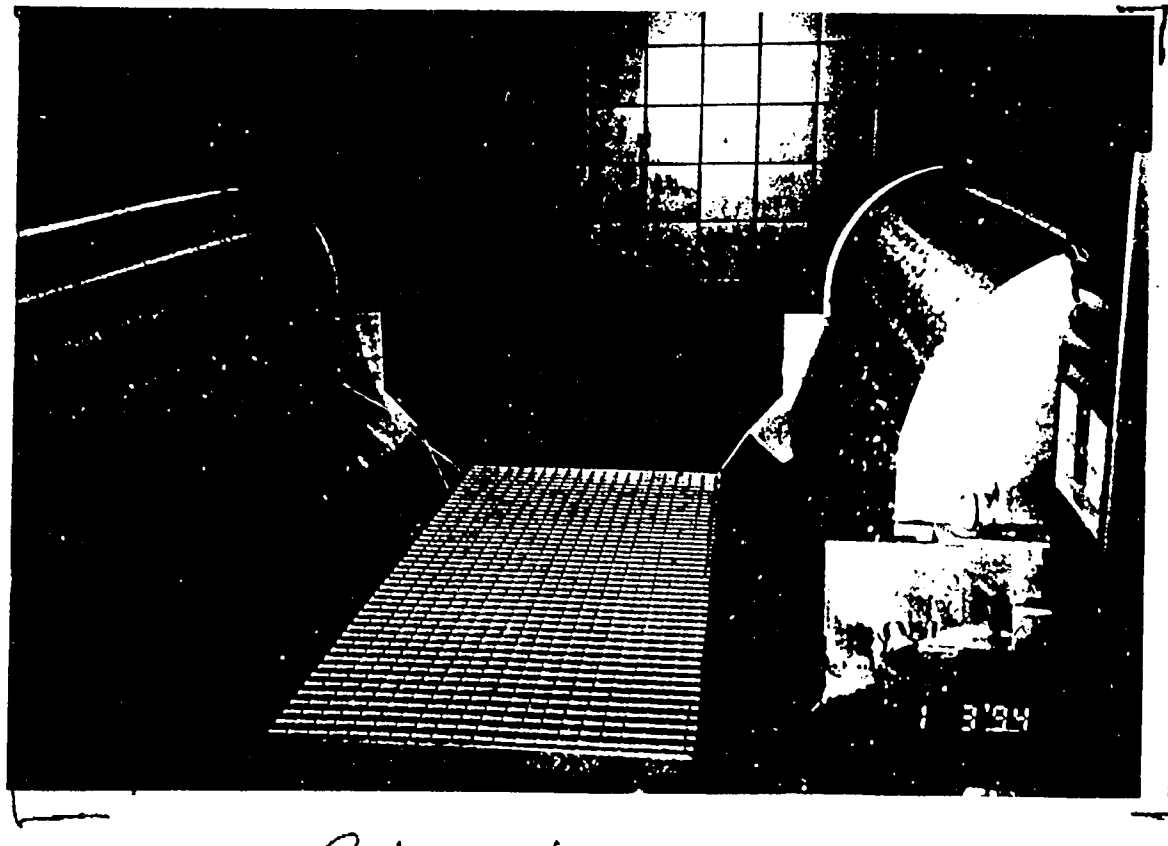
A-9.2 Can Washer at Ostrolaba


A-10.1 Typical Cleanup Hose at Ostiolaba


A-10.2 Boring Line at Ostiolaba



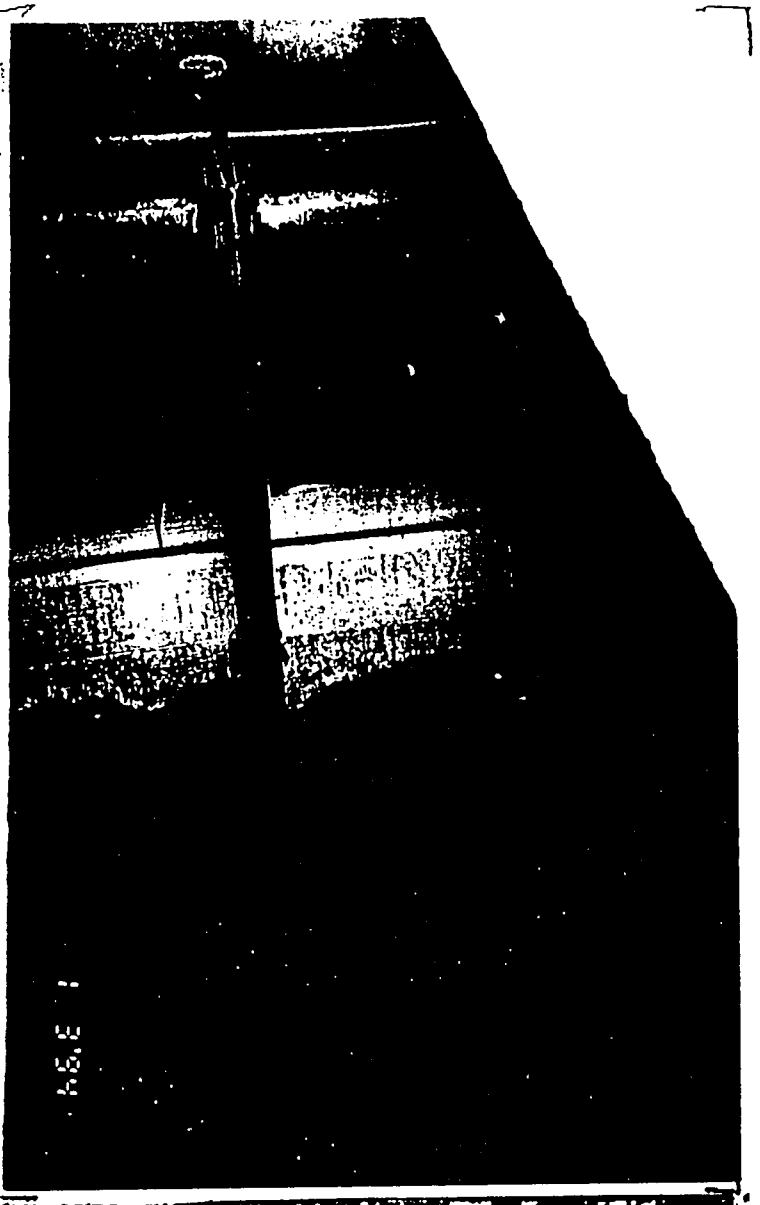
A-11.1 Typical Reconditioned Condor at Estrolaba

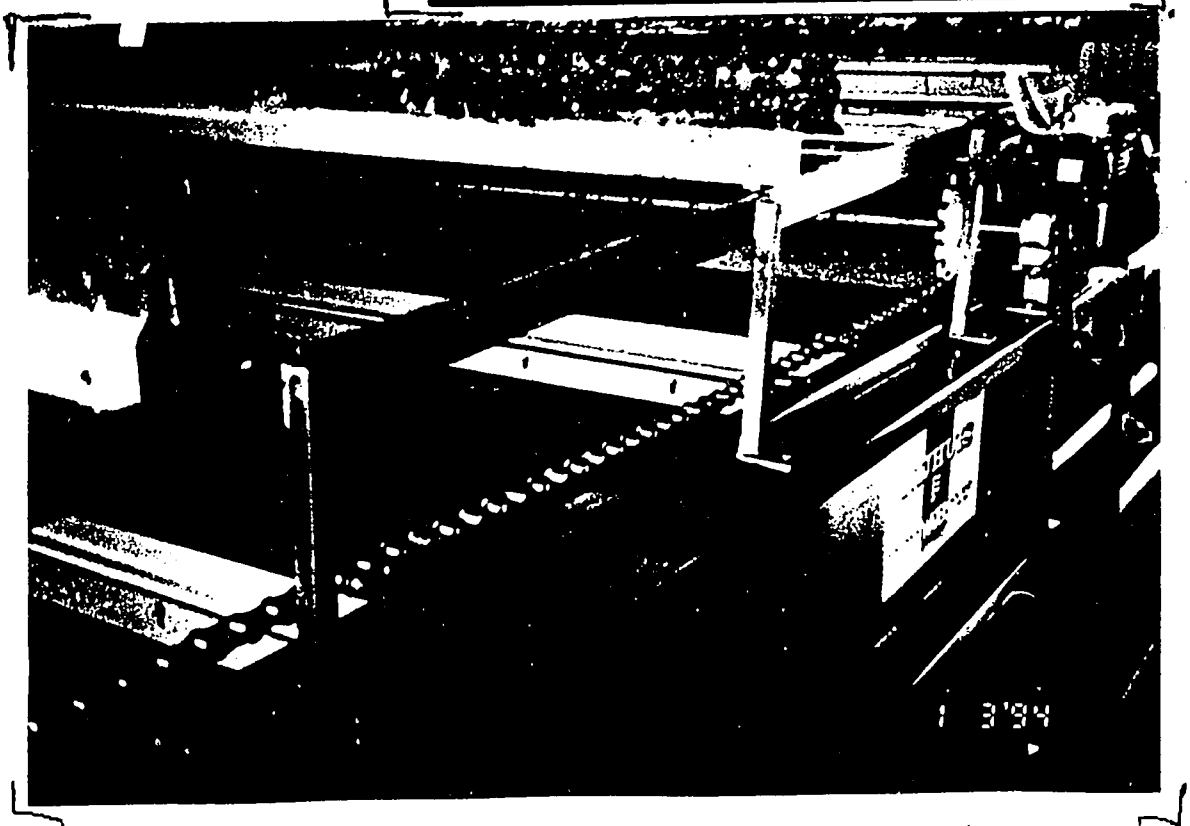


A-11.2 Rotoatrainers at Estrolaba

A-12.1 Astrolabe
Hydrasieves
Screening
Wastewater



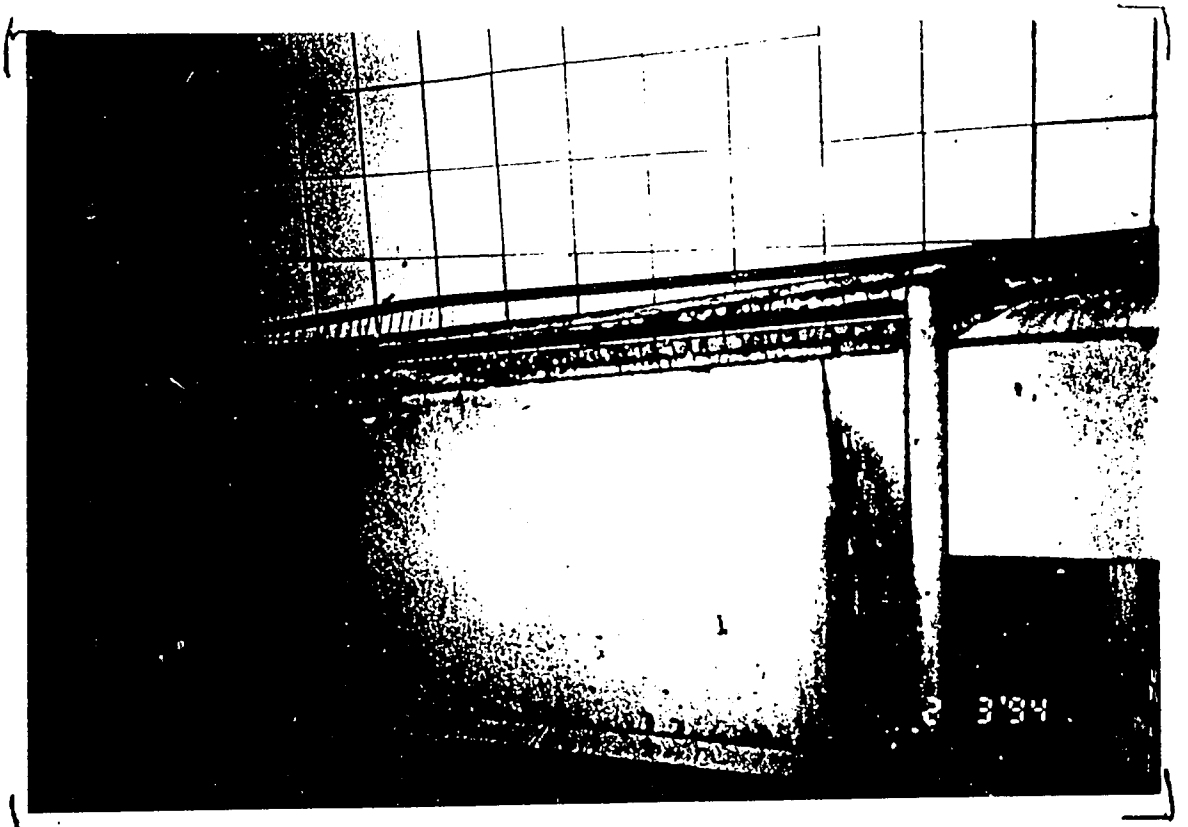




A-12.2 Chemically Enhanced Dissolved Air Flotation

A-13.1 Lubow Plant Administration Building

A-13.2 General View of Lubow Plant

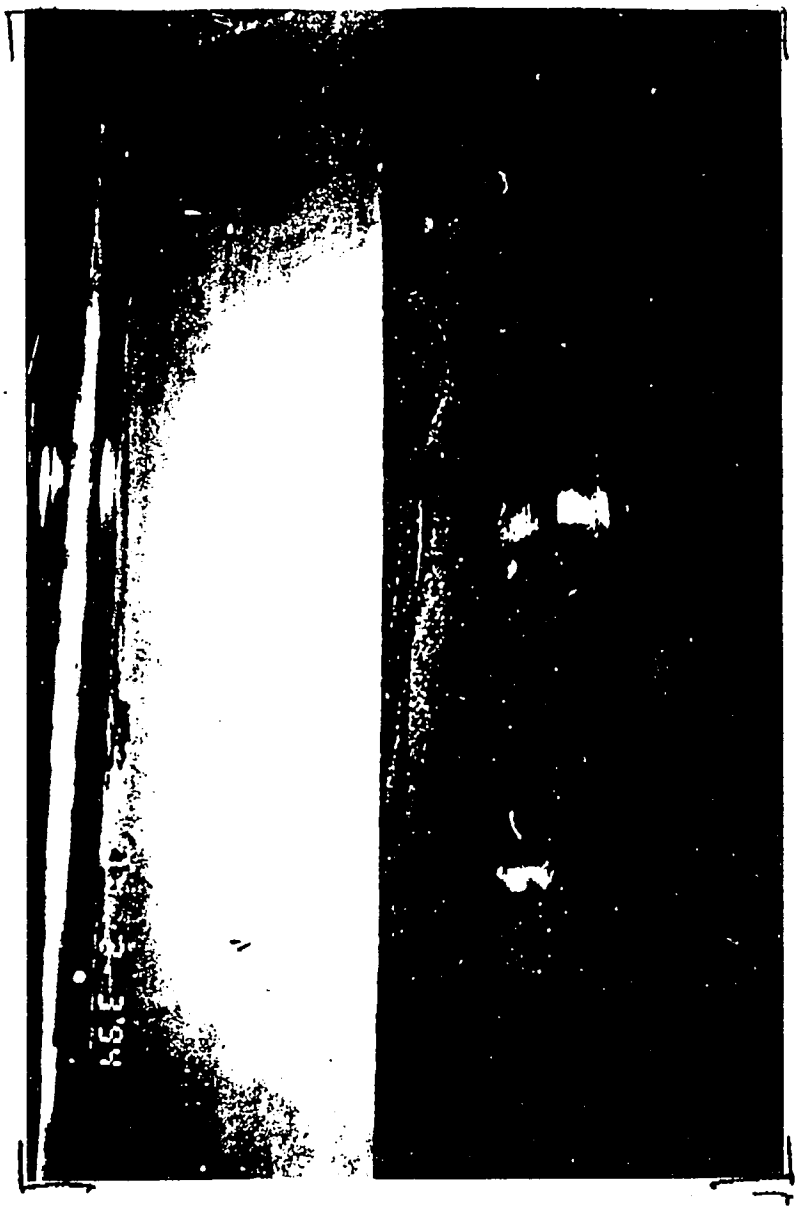


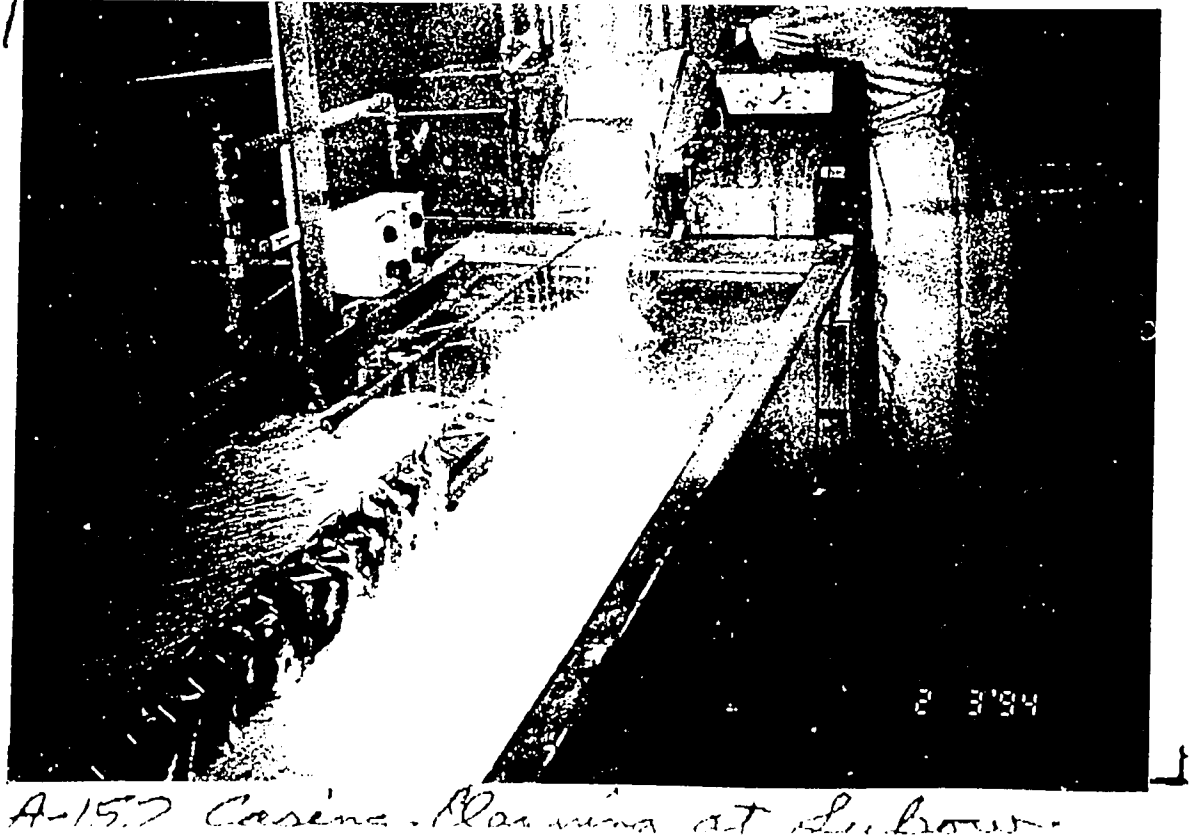
A-14.1 Drilled Pipe Pig Shown at Lubow

A-14.2 Lubow Pig Butchering. (Note material on floor)

A-15, 1 Inboard
Shower Head Type
Pig Carcass Sprays



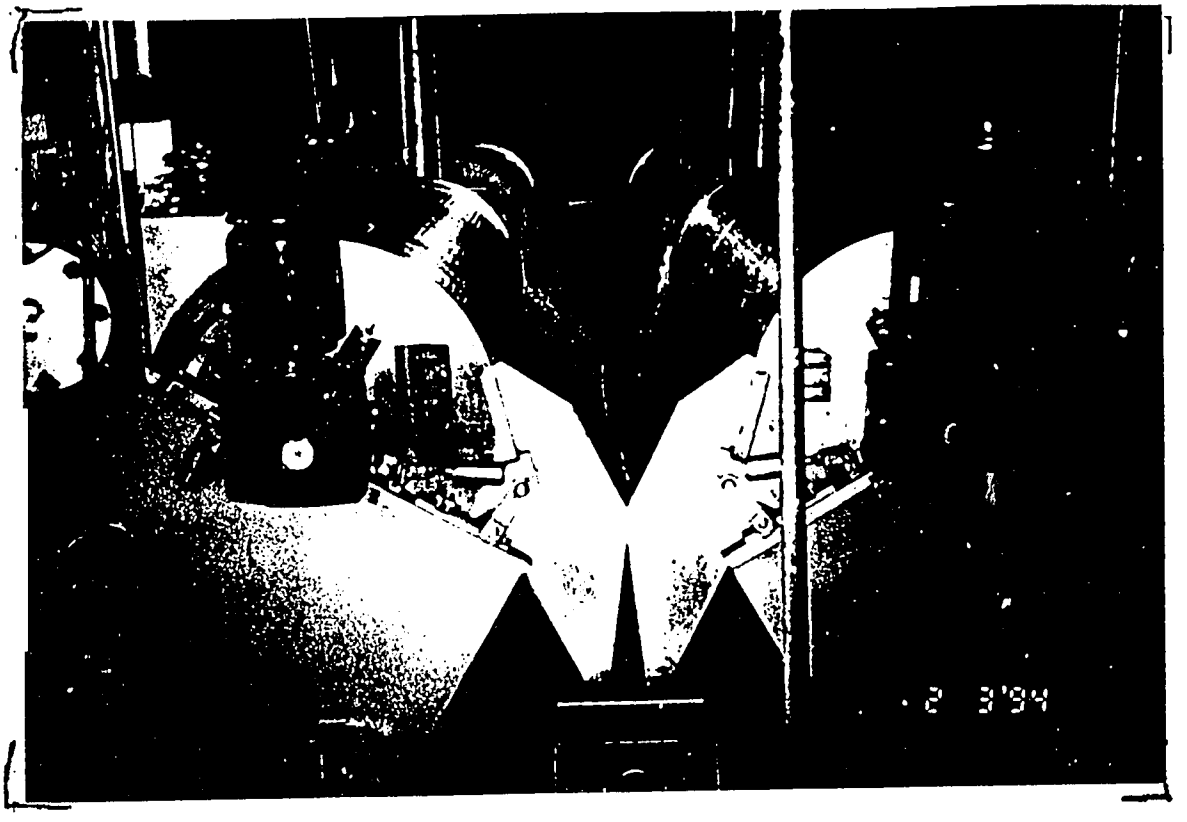





A-15.2 Casing - Running at L. Bonus

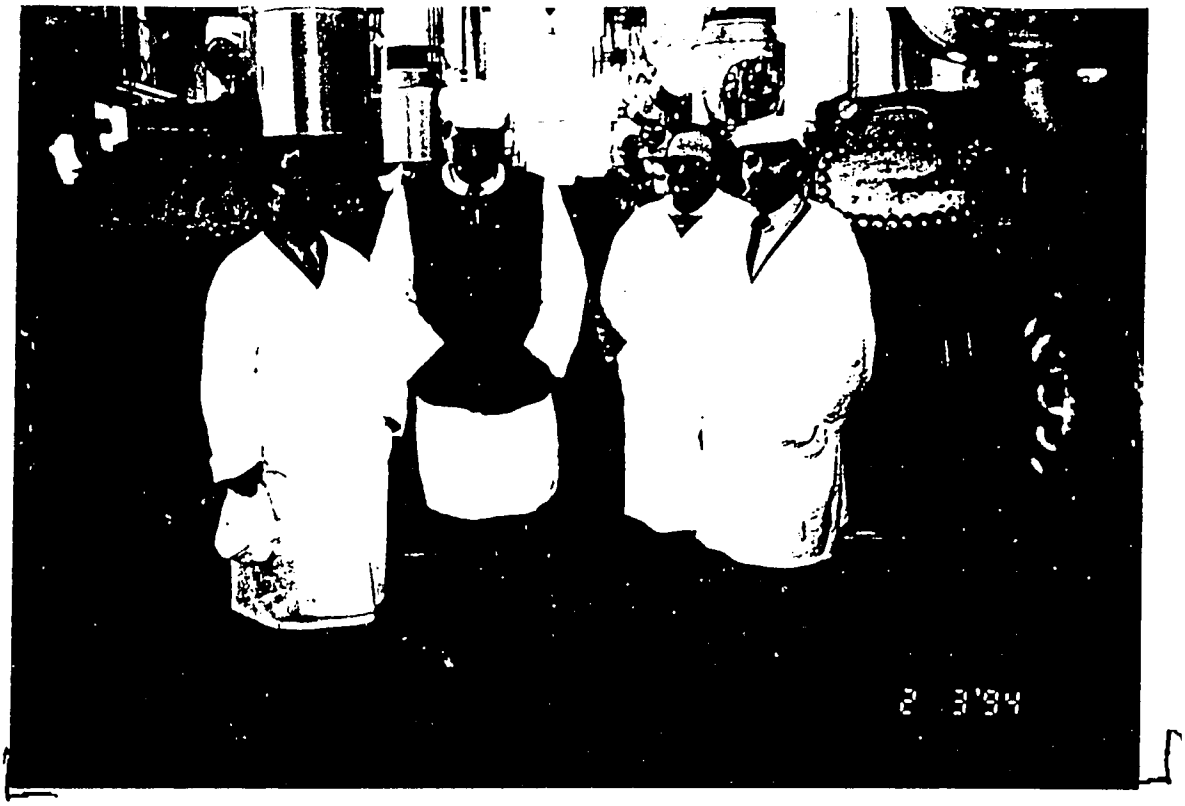

A-16.1 Boning Department at Lubow. (Note Product Catch Container at End of Steel Belt Conveyor)


A-16.2 Typical Cleanup Hose with Finger Nozzle at Lubow



A-17.1 Rotostrainer Screening Wastewater at Lubow

A-17.2 Two Stage Dissolved Air Flotation at Lubow, Chemical Addition in Second Stage




A-18.1 In Ammonia Refrigeration Compressor Room at Lubow's

## APPENDIX B

Itinerary of Donald O. Dencker, P.E. was as follows:

| | |
|---|---|
| February 24 | Arrive Warsaw, Poland from Tallinn, Estonia |
| February 25 | Elk, Poland - Visit Meat Plant W.P.P.M. Zaklady Miesne W Elka |
| February 26 | Warsaw, Poland - Saturday |
| February 27 | Warsaw, Poland - Sunday |
| Feruary 28 | Elblag, Poland - Visit Meat Plant<br>Zaklady Miesne W Elblagu P.P. |
| March 1 | Ostraleka, Poland - Visit Meat Plant<br>Zaklady Miesne Ostroleka S.A. |
| March 2 | Lubow, Poland - Visit Meat Plant<br>Zaklady Miesne W Lukowie |
| March 3 | Depart Warsaw, Poland to Madison<br>Wisconsin, USA |

## APPENDIX C

Persons and Organizations Visited

A. Zaklady Miesne W Elku, Elk, Poland

Mr. Jarzy Gasiewski ..... Plant Director
Mr. Dariusz Rosolowski ..... Production Manager
Mr. Zbignien Leszkiewicz ..... Environmental Specialist

B. Zaklady Miesne W Elblagu, Elblag, Poland

Mr. Jerzy Karpinski ..... General Director
Mr. Andrzej Klyk ..... Technology, Quality & Development Manager
Mr. Roman Lupinski ..... Head Maintenance Specialist
Mr. Teodor Mongiallo..... Slaughterhouse Manager

C. Zaklady Miesne Ostroleka, Ostroleka, Poland

Mr. Andrzej Sochocki..... General Director
Mr. Kazimierz Karninski ..... Production Director
Mr. Andrzej Jagielski ..... Technical Bureau Manager
Ms. Maria Sochocka ..... Environmental Specialist

D. Zaklady Miesne W Lukowie, Lukow, Poland

Mr. Miroslaw Kursa ..... Plant Director
Mr. Antoni Galka ..... Technical Director
Mr. Andrzej Skowronski ..... Production Manager
Mr. Jerzy Zurawski..... Energy Dept. Manager
Mr. Czeslaw Krzywicki..... Environmental Specialist

## APPENDIX D

Business Cards of Persons Contacted

A. Zaklady Miesne W. Elku, Elk, Poland

B. Zaklady Miesne W Elblagu, Elblag, Poland

C. Zaklady Miesne Ostroleka, Ostroleka, Poland

D. Zaklady Miesne W Lukowie, Lukow, Poland

E. World Environment Center, Poland

W.P.P.M. Zakłady Mięsne
w Ełku

**mgr inż. Jerzy Gąsiewski**
Z-ca Dyrektora d/s Technicznych

Adres służbowy:
ul. Suwalska 86
19-300 EŁK
tel. 10-39-35
tlx 052-6734
fax /887/ 10-84-69

Adres prywatny:
ul. Mickiewicza 4/29
19-300 Ełk
tel. /887/ 10-96-66

2/25/94 [illegible]

W.P.P.M. Zakłady Mięsne
w Ełku

**Dariusz Rosołowski**
Szef produkcji

ul. Suwalska 86
19-300 Ełk
tel. /887/ 10-96-21 w. 115, 262
tlx 052-6734
fax /887/ 10-84-69

Ełk
2/25/94

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**ZAKŁADY MIĘSNE W ELBLĄGU P.P.**
*82-300 Elbląg ul. Żeromskiego 2*

**mgr inż. ROMAN ŁUPIŃSKI**
*Główny Specjalista d/s Zaplecza*
*i Utrzymania Ruchu*

*tel. centr. 33-48-85 w. 194 tel. 33-49-76 fax 33-57-88 tlx 057223*
*Dom: Elbląg, ul. Szarych Szeregów 6 m 1*
Home 33 1598 2/28/94

**ZAKŁADY MIĘSNE W ELBLĄGU P.P.**
*82-300 Elbląg ul. Żeromskiego 2*

**inż. JERZY KARPIŃSKI**
*Dyrektor Naczelny*

*tel./fax (0-50) 33-57-88 tlx 057223*
*Dom: Elbląg, ul. J.Brzechwy 30m5 tel. 32-29-64*

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**ZAKŁADY MIĘSNE W ELBLĄGU P.P.**
*82-300 Elbląg ul. Żeromskiego 2*

Kierownik Działu
i Produkcji Rzeźniane[illegible]

*mgr inż. Teodor Mongiałło*

*tel. centr. 33-48-85 tel. 33-49-76 fax 33-57-88 tlx 057223*
2/28/94

**ZAKŁADY MIĘSNE W ELBLĄGU P.P.**
*82-300 Elbląg ul. Żeromskiego 2*

Kierownik Działu
Technologii, Jakości
i Rozwoju Produkcji

*mgr inż. Andrzej Kłyk*

*tel. centr. 33-48-85 tel. 33-49-76 fax 33-57-88 tlx 057223*
2/28/94

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Zakłady Mięsne OSTROŁĘKA S.A.

ZAKŁADY MIĘSNE
"OSTROŁĘKA"
S.A.
07-400 Ostrołęka
ul. Przemysłowa 1

mgr inż. Andrzej Jagielski
Kierownik Biura Techniki

tel. (888) 32-51/5 w. 341
fax (888) 50-72
tlx 87301, 87302 zmost

Tel. biura 38-48

3/1/94

Zakłady Mięsne OSTROŁĘKA S.A.

3/1/94
ZAKŁADY MIĘSNE
"OSTROŁĘKA"
S.A.
07-400 Ostrołęka
ul. Przemysłowa 1

lek. wet. Andrzej Sochocki
Prezes Zarządu — Dyrektor Naczelny

tel. 69-46 (888)
tlx 87301, 87302 zmost
fax 50-72 (888)

Tel. domowy 66-391

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Zakłady Mięsne OSTROŁĘKA S.A.

3/1/94
ZAKŁADY MIĘSNE
"OSTROŁĘKA"
S.A.
07-400 Ostrołęka
ul. Przemysłowa 1

mgr inż. Kazimierz Kamiński
Zastępca Prezesa, Dyrektor ds. Produkcji

tel (029) 32-51/5 w 341
fax (029) 50-72
tlx 87301, 87302 zmost

-4/6-

Tel biura 38-48

3/2/94

**Inż. ANTONI GAŁKA**
Z-ca Dyr. ds. Technicznych
ZAKŁADY MIĘSNE W ŁUKOWIE

21-400 ŁUKÓW
ul. Przemysłowa 1
Telex 84546 ZM Łuk pl
84547 ZM Łuk pl
Fax 42-32

Tel. służbowy: 26-58
2401—2412 wew. 226
Tel. prywatny: 28-54

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3/2/94

ZAKŁADY MIĘSNE
w ŁUKOWIE

ZAKŁADY MIĘSNE W ŁUKOWIE
Główny Energetyk

21-400 ŁUKÓW
ul. Przemysłowa 1
tel. centr. 24-01 do 12
tlx. 84546/84547
fax. 42 32

---

mgr inż. Jerzy Żurawski
tel. służb. 244 tel. dom.

---

ZAKŁADY MIĘSNE
w ŁUKOWIE

mgr inż. ANDRZEJ SKOWROŃSKI
Szef Produkcji

21-400 Łuków
ul. Przemysłowa 1
tlx 84546/84547
fax 4232
tel. służb. 2401÷12 w. 289
tel. pryw. 4616

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3/2/94

SPECJALISTA
d/s Gospodarki Wodno-Ściekowej
i Ochrony Środowiska

mgr inż. Czesław Krzywicki
Environmental Specialist

---

Henry 2/24/94

World Environment Center

ENG. HENRYK SOJKA
COORDINATOR FOR POLAND
TECHNICAL PROGRAMS

WORLD ENVIRONMENT CENTER
419 PARK AVENUE SOUTH
SUITE 1800
NEW YORK, N.Y. 10016

40026 KATOWICE
UL. KOBYLINSKIEGO 2A/20
TEL. 510-001
156-44-44

## APPENDIX E

Curriculum Vitae of Mission Expert Donald O. Dencker

General: [redacted]
World War II service in Pacific - Sgt. Infantry, U.S. Army
Korea War Service - 1st. Lt. Corps. of Engineers, U.S. Army in Korea
Registered Professional Engineer in Wisconsin and Minnesota.

Education:

| | |
|---|---|
| January 1949 | Bachelor of Science, Civil Engineering, University of Minnesota |
| June 1950 | Master of Science, Civil Engineering, University of Minnesota (Sanitary Engineering major) |
| 1952-Present | Numerous University level short courses in environmental engineering area |

Professional Experience:

| | |
|---|---|
| 1990-1991 | Retired as Associate Director, Corporate Engineering, Oscar Mayer Food Corporation, Madison, WI |
| 1984-1990 | Manager, Major Engineering Projects, Oscar Mayer, Madison, WI (Dual-responsibility) |
| 1964-1990 | Environmental Engineering Manager, Oscar Mayer Foods Corporation, Madison, WI |
| 1958-1964 | Sanitary Engineer, Oscar Mayer Foods Corporation, Madison, WI |
| 1956-1958 | City Engineer, City of Columbia Heights, MN |
| 1950 and 1952-1956 | Sanitary Engineer, Pfeiffer & Schultz Engineers, Minneapolis, MN |

Professional Activities:

American Academy of Environmental Engineers, Diplomate

American Meat Institute, Chairman of Environmental Committee for 16 years

Water Environment Federation

American Water Works Association

Illinois, Iowa, and Minnesota Manufacturing Associations, Member of Environmental Committees

Chicago Association of Commerce & Industry, Member of Environmental Committee

Prepared and presented numerous papers on meat industry and wastewater treatment and waste prevention

Meat plant waste minimization studies in Chile, Estonia and Jordan

Registered Civil Engineer