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ABSTRACT

To improve vocational educational programs in agriculture, occupational information on a common core of basic skills within the occupational area of the dairy plant worker is presented in the revised task inventory survey. The purpose of the occupational survey was to identify a common core of basic skills which are performed and are essential for success in the occupation. Objectives were accomplished by constructing an initial task inventory to identify duty areas and task statements for the occupation. The initial task inventory was reviewed by consultants in the field, and 175 tasks were identified. A random sample of 75 dairy plants was obtained. Data was collected utilizing employer and employee questionnaires. Thirty-three questionnaires were returned of which 30 were usable. A compilation of basic sample background information is presented on size of dairy plant, total work experience, employment at current job, and preparation as a dairy plant worker. A compilation of duty areas of work performed and work essential for the occupation is given. Percentage performance by incumbent workers and the average level of importance of specific task statements are presented in tabular form. (Author/EC)

AN EMPERICAL DETERMINATION OF TASKS ESSENTIAL TO SUCCESSFUL PERFORMANCE AS A DAIRY PLANT WORKER

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FOREWORD

The Department of Agricultural Education at The Ohio State University is involved in a major programmatic effort to improve the curricula in educational programs in agriculture. One product in this effort is this report of the dairy plant worker task inventory survey. The data reported were collected as part of a more comprehensive thrust designed to develop a common core of basic skills in agribusiness and natural resources.

It is hoped that the revised task inventory contained in this report will be useful to curriculum developers working for improved occupational relevance in schools. Twenty-seven additional inventories in other occupational areas are also reported from this project.

The profession owes its thanks to Daniel Miller, graduate research associate, for his work in preparing this report. Special appreciation is also expressed to Dr. John B. Lindamood, Professor in the Department of Food Science and Nutrition at The Ohio State University, for his help in identifying the population.

J. David McCracken
Project Director

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INTRODUCTION

Occupational information is needed to develop and revise vocational and technical education curricula. Teachers and curriculum developers generally determine which skills might be taught in a program based upon teacher expertise, advisory committee input, informal and formal community surveys, and/or task inventories.

The Agricultural Education Department at The Ohio State University has utilized and revised a system for obtaining and using occupational information as an effective aid in planning, improving, and updating occupational education curricula. This report presents the results of a survey of the occupation, dairy plant worker. The information contained herein may be used by curriculum development specialists, teachers, local and state administrators, and others involved in planning and conducting vocational and technical programs in agriculture.

Purpose and Objectives

The major purpose of the occupational survey was to identify the skills which are performed and essential for success as a dairy plant worker. The specific objectives of this survey were as follows:

1. Develop and validate an initial task inventory for the dairy plant worker.

2. Identify the specific tasks performed by dairy plant workers.

3. Determine the relative importance of the specific tasks to successful employment as a dairy plant worker.

Definition of the Occupational Area

The dairy plant worker works in milk receiving plants which process a variety of products for sale to retail outlets. The dairy plant worker helps to process incoming raw milk; operates and maintains dairy plant equipment; maintains sanitary working conditions; stores raw milk and milk products; and may be involved with specific processing functions. The dairy plant worker may be involved with clarifying, pasteurizing, and homogenizing milk and in preparing milk products such as cheeses, ice cream, and other cultured products. The specific duties of the dairy plant worker will be influenced to a large extent by the size of the operation. The dairy plant worker may also be called a dairy plant laborer or milk plant worker.

METHODOLOGY

Objectives were accomplished by constructing an initial task inventory, validating the initial inventory, selecting a sample of workers, collecting data, and analyzing data.

Initial Task Inventory

Duty areas and task statements for the dairy plant worker were identified by searching existing task lists, job descriptions, curriculum guides, and reference publications. Additionally, contacts with several industry personnel aided in clarifying the specific responsibilities of the dairy plant worker. All the tasks that the project staff thought to be performed were assembled into one composite list.

The initial tasks were grouped into functional areas called "Duties".

After the task statements were grouped under the proper duty areas, each task statement was reviewed for brevity, clarity, and consistency. In all, 145 task statements were included in the initial task inventory.

Initial Inventory Validation

After the initial task inventory was constructed, it was reviewed by ten consultants employed in dairy plants. These consultants were either managers, owners, or plant workers.

The consultants were asked to respond to the initial task list inventory by performing the following activities:

1. Indicate whether any of the tasks listed were not appropriate.

2. Add any additional tasks they believed were performed by dairy plant workers.

3. Make changes in the wording of tasks to help add clarity to the statements.

The comments from the ten consultants were pooled and revisions were made. Three new duty areas were added.

As a result of the initial task inventory review process, 175 tasks were identified.

Worker Sample Selection

Since the specific duties and tasks performed by individual dairy plant workers are related to the size and type of business where employed, an attempt was made to survey dairy plant workers employed in various sizes and types of dairy plants. It was not possible to secure a list of the specific names and addresses of all incumbent workers in the state. Therefore, a sample of 75 dairy plants was obtained from the records of Dr. Lindamood of The Ohio State University using a stratified random sampling approach. The strata used were type of dairy plant and geographical location.

Data Collection

A packet of materials was sent to the plant manager of the randomly-selected dairy plants. The packet of materials included:

1. A cover letter on Ohio State University stationery.
2. An employer questionnaire printed on blue.
3. An employee questionnaire printed on yellow.
4. A stamped and self-addressed return envelope.

The manager was instructed to complete the employer questionnaire and to have a responsible dairy plant worker complete the employee questionnaire. The manager was instructed to collect the employee questionnaire and return both the employer and employee questionnaire in the stamped and self-addressed return envelope by the date specified in the cover letter.

A follow-up of non-respondents consisted of mailing a packet of materials two weeks after the initial mailing. The follow-up consisted of a packet of materials identical to the initial packet.

Data Analysis

The 33 questionnaires which were returned were checked for completeness and accuracy by the project staff. Information from the 30 usable responses was coded on Fortran coding sheets for key punching. In addition to coding appropriate respondent background information, each specific task statement was coded as to whether it was performed (1 = Task performed by respondent; blank = Task not performed by respondent) and the level of importance of the task (3 = Essential; 2 = Useful; 1 = Not Important). The information was keypunched on IBM cards and verified by personnel at the Instruction and Research Computer Center at The Ohio State University.

The data was analyzed using the SOUPAC computer program and the facilities of the Instruction and Research Computer Center. Consultant assistance for analyzing the data was provided by personnel at The Center for Vocational Education. The SOUPAC computer analysis resulted in the computation of relative frequencies, means, and rankings for each task statement. The results of the computer analyses were printed in tabular form for ease of interpretation.

FINDINGS

Objectives of the study resulted in the compilation of basic sample background information, the determination of tasks performed by the dairy plant worker, and the identification of tasks essential to successful performance as a dairy plant worker.

Description of the Sample

Information regarding the performance of tasks and the importance of the tasks to successful employment as a dairy plant worker was obtained from employees in various dairy plants across Ohio.

Response to the Survey

A total of 75 questionnaires were mailed and 33 replies were received. This represented a 44% rate of return. The response to the questionnaire is summarized in TABLE I.

TABLE I

EMPLOYEE RESPONSE TO THE QUESTIONNAIRE

	N	Percent of All Employees In the Survey
Employees in Survey	75	100.0
Total Returns	33	44.0
Usable Returns	30	40.0
Unusable Returns	3	4.0
Nonrespondents	42	56.0

Size of Dairy Plant

Dairy plant workers from various size dairy plants were included in the study. The number of full-time equivalent (two one-half time dairy plant workers equal one full-time equivalent) dairy plant workers employed in the firm was used as an index to assess the size of business where the worker was employed. Of the 33 questionnaires received, 30 included information regarding the size of the business. TABLE II summarizes the responses to

TABLE II

SIZE OF DAIRY PLANT WHERE CURRENTLY EMPLOYED

Number of Plant Workers Employed in Business	N	Percent of Respondents
1-20	11	36.7
21-30	3	10.0
31-40	3	10.0
41-50	3	10.0
51 or more	10	33.3
Total	30	100.0

$\bar{X}$ number of plant workers in the business = 44.4

the question, "How many full-time equivalent dairy plant workers are employed in your business?" Eleven dairy plant workers or 36.7% were employed in firms employing 1-20 full-time equivalent dairy plant workers. Ten dairy plant workers or 33.3% were employed in firms employing 51 or more full-time equivalent dairy plant workers. The number of full-time equivalent dairy plant workers employed in the firms ranged from 4-300. An analysis of TABLE II indicates that 66.7% of the dairy plant workers were working in firms employing 1-50 full-time equivalent dairy plant workers. The average number of full-time equivalent dairy plant workers employed in the firms was 44.4.

Total Work Experience

Dairy plant workers with varying amounts of work experience in the dairy products processing industry were included in the study. TABLE III summarizes the responses to the question, "How many total years have you worked in the dairy products processing industry?" Ten dairy plant workers or 33.3% had 26 or more total years of work experience in the dairy products processing industry. Six dairy plant workers or 20% had from 21-25 total years of work experience in the dairy products processing industry. Five dairy plant workers or 16.7% had from six to ten years of total work experience in the dairy products processing industry. The total years of work experience in the dairy products processing industry ranged from 3-45 years. Dairy plant workers had an average of 21.8 years of total work experience in the dairy products processing industry.

TABLE III

TOTAL AMOUNT OF WORK EXPERIENCE IN THE DAIRY PRODUCTS PROCESSING INDUSTRY

Years	N	Percent of Respondents
1-5	4	13.3
6-10	5	16.7
11-15	2	6.7
16-20	3	10.0
21-25	6	20.0
26 or more	10	33.3
Total	30	100.0

$\bar{X}$ years in the industry = 21.8

Employment at Current Job

Dairy plant workers in the survey had spent varying amounts of time in their present job. TABLE IV summarizes the responses to the question, "How many years have you worked at your present job?" Nine dairy plant workers or 30% had worked at their present job from four to eight years. Seven dairy plant workers or 23.4% had worked at their present job from one to three years. Six dairy plant workers had worked at their present job 21 or more years. The years of work at their present job ranged from 1-45 years. Dairy plant workers had been employed at their present job an average of 13.2 years.

Preparation as a Dairy Plant Worker

Dairy plant workers obtained training for their job from various sources. TABLE V summarizes their responses to the question, "Where did you receive your training as a dairy plant worker?" Twenty-seven dairy plant workers or 90% indicated they received training on-the-job. Six dairy plant workers or 20% indicated they received training from other sources. Four dairy plant workers or 13.3% indicated they had received training by attending adult education courses.

TABLE IV

LENGTH OF TIME AT PRESENT JOB

Years	N	Percent of Respondents
1-3	7	23.4
4-8	9	30.0
9-15	4	13.3
16-20	4	13.3
21 or more	6	20.0
Total	30	100.0

$\bar{X}$ years at present job = 13.2

TABLE V

SOURCE OF TRAINING RECEIVED AS A DAIRY PLANT WORKER

Source	N	Percent of All Employees In The Survey
On-The-Job	27	90.0
Technical School Program	1	3.3
Adult Education Program	4	13.3
Other	6	20.0

Duty Areas of Work Performed by the Dairy Plant Worker

The 175 tasks were grouped under 18 duty areas. Each respondent indicated whether he performed the specific task in his current position as a dairy plant worker. The percentages of respondents performing each task were averaged for all tasks under each duty area. The mean percentage of incumbents who performed specific tasks in specified duty areas is presented in TABLE VI.

Duty areas of work in which 50% or more of the incumbent workers performed the tasks were:

1. Recording Information
2. Following General Safety Precautions
3. Receiving Raw Milk
4. Storing and Refrigerating Raw Milk and Milk Products
5. Cleaning and Sanitizing Milk Plant Equipment and Facilities
6. Homogenizing Milk
7. Separating Milk
8. Packaging Milk and Dairy Products

Duty Areas of Work Essential for Successful Performance as a Dairy Plant Worker

A level of importance rating was obtained for each task. The respondent could rate the task as essential, useful, or not important for successful performance as a dairy plant worker. A ranking of essential was assigned a numerical rating of "3", useful a numerical rating of "2", and not important a numerical rating of "1". The level of importance ratings for each task were averaged for all tasks under each duty area. The average level of importance ratings for the specific tasks in the specified duty areas are presented in TABLE VI.

Duty areas of work which received a 2.0 or higher level of importance rating by incumbent workers were:

1. Recording Information
2. Following General Safety Precautions
3. Receiving Raw Milk
4. Maintaining Equipment
5. Using and Maintaining Hand and Power Tools
6. Operating Dairy Plant Equipment
7. Maintaining Plant Facilities and Structures
8. Storing and Refrigerating Raw Milk and Milk Products
9. Cleaning and Sanitizing Milk Plant Equipment and Facilities
10. Clarifying Raw Milk
11. Pasteurizing Milk
12. Homogenizing Milk
13. Separating Milk
14. Packaging Milk and Dairy Products

Percentage Performance and Level of Importance Ratings of Specific Tasks

The percentage performance by incumbent workers and the level of importance for each specific task is also presented in TABLE VI.

It is recommended that the results for each specific task be examined by educators and others who are developing educational programs to determine curriculum content for preparing dairy plant workers. Specific tasks with a high level of performance and a high level of importance rating should be given more emphasis in the educational program than specific tasks with a low level of performance and a low level of importance rating.

TABLE VI

PERCENTAGE PERFORMANCE AND AVERAGE RATING OF IMPORTANCE*
OF SPECIFIC TASKS

TASK STATEMENTS	Percent Performing	Average Level of Importance
Recording Information		
Record weighing information	66	2.6
Record delays in daily receiving operation	50	1.9
Record storage information	59	2.5
Record temperature information	73	2.7
Mean Rating	62.0	2.4
Following General Safety Precautions		
Use first aid kits for minor bruises, cuts, and burns	79	2.6
Follow safe work habits	76	2.8
Identify potential safety hazards	63	2.7
Store chemicals	59	2.3
Use fire extinguishers	59	2.7
Wear proper protective clothing	63	2.5
Ventilate work areas	56	2.4
Interpret information on labels and signs	56	2.5
Use proper lifting and carrying methods	59	2.6
Store inflammable materials	39	2.5
Wear proper work clothes	69	2.6
Dispose of chemical containers	53	2.3
Adjust safety devices	39	2.2
Install safety devices	33	2.2
Correct potential safety hazards	53	2.4
Remove debris from work areas	68	2.7
Use electrical connectors and safety devices	53	2.5
Identify safety zones around equipment	39	2.4
Clean up chemical spills	66	2.7
Mean Rating	56.9	2.5
Receiving Raw Milk		
Label samples	73	2.9
Bottle milk samples for quality control tests	63	2.6
Determine amount of milk needed for samples	50	2.4
Determine how often to sample milk	59	2.4
Determine where to transfer milk	59	2.3

*Average rating of importance may range from 1-3 with 3 being the highest

TABLE VI (Cont.)

PERCENTAGE PERFORMANCE AND AVERAGE RATING OF IMPORTANCE OF SPECIFIC TASKS

TASK STATEMENTS	Percent Performing	Average Level of Importance
Draw representative milk sample	69	2.7
Dump milk	43	2.1
Hook-up milk unloading equipment	69	2.6
Select proper equipment for sampling milk	63	2.5
Unload bulk tankers	69	2.7
Unload milk cans	26	1.4
Weigh tankers	33	2.2
Mean Rating	56.3	2.4
Maintaining Equipment		
Clean equipment thoroughly	79	2.8
Grease equipment	59	2.5
Check and replace bearings	36	2.3
Oil equipment	50	2.5
Replace the fusible plug in the boiler	26	2.0
Identify the types of pumps used in a dairy plant	39	1.8
Mean Rating	48.2	2.3
Using and Maintaining Hand and Power Tools		
Adjust tools	23	2.2
Clean tools	29	2.2
Identify tools	26	1.9
Select tools for specific jobs	29	2.1
Store tools	33	2.1
Use hand tools safely	43	2.4
Use power tools safely	36	2.4
Mean Rating	31.3	2.2
Operating Dairy Plant Equipment		
Interpret gauge readings on equipment	79	2.7
Adjust equipment safety devices and shields	46	2.5
Correct potential equipment safety hazards	53	2.5
Identify potential equipment safety hazards	59	2.5
Install equipment safety shields and devices	33	2.4

TABLE VI (Cont.)

PERCENTAGE PERFORMANCE AND AVERAGE RATING OF IMPORTANCE OF SPECIFIC TASKS

TASK STATEMENTS	Percent Performing	Average Level of Importance
Operate vacuum pan	29	1.6
Operate filler	56	2.6
Operate sterilizer	23	1.7
Operate labeler	33	1.9
Operate dryer	13	1.4
Operate butter churn	9	1.3
Operate butter packaging machine	9	1.3
Operate truck	39	2.0
Operate clarifier	53	2.4
Operate pasteurizer	66	2.8
Operate separator	63	2.7
Operate homogenizer	63	2.7
Operate receiving equipment	69	2.7
Operate ice cream fruit feeder	23	1.4
Operate ice cream packing equipment	23	1.5
Operate ice cream freezer	23	1.5
Mean Rating	41.1	2.0
Maintaining Facilities and Structures		
Paint interior and exterior of buildings when necessary	53	2.1
Lubricate electric motors and pumps	39	2.3
Repair electrical cords	29	2.2
Replace worn drive belts	33	2.2
Reset circuit breakers	56	2.5
Provide proper heat for buildings	33	2.0
Replace faucets	29	2.0
Repair broken windows	29	2.0
Remove trash from facilities	68	2.7
Clean-up spilled materials	69	2.7
Check expansion joints at regular intervals	13	1.8
Wash the filter bed	23	1.6
Mean Rating	39.5	2.2
Storing and Refrigerating Raw Milk and Milk Products		
Adjust temperatures in storage tanks	63	2.5
Determine the time interval milk and various milk products may be stored	59	2.5

TABLE VI (Cont.)

PERCENTAGE PERFORMANCE AND AVERAGE RATING OF IMPORTANCE OF SPECIFIC TASKS

TASK STATEMENTS	Percent Performing	Average Level of Importance
Determine proper storage temperatures for products	59	2.6
Recognize signs of spoilage	66	2.6
Rotate milk and products in storage	63	2.8
Date products placed in storage	59	2.7
Determine the raw milk storage capacity	63	2.4
Drain tanks	63	2.7
Fill storage tanks	66	2.6
Follow recommended cool-down rate for milk products	63	2.7
Identify critical storage conditions for milk products	59	2.6
Measure milk in tanks	69	2.5
Store products in proper place and sequence	69	2.7
Standardize milk and milk products according to federal and state compositional standards	73	2.7
Mean Rating	63.9	2.6
Cleaning and Sanitizing Milk Plant Equipment and Facilities		
Wash down work areas	73	2.7
Evaluate the influence unsanitary conditions have on the quality of the product	66	2.7
Follow personal health practices to reduce contamination problems	76	2.8
Select appropriate cleaning and sanitizing materials	69	2.6
Assemble processing equipment after cleaning and sanitizing	69	2.8
Clean and sanitize bulk tanker	66	2.7
Clean and sanitize milk cans	53	2.1
Collect and pre-rinse plant equipment parts	69	2.7
Control flies and rodents in the plant area	66	2.7
Determine how the sanitary quality of milk is determined	53	2.3
Determine when to clean and sanitize the equipment	73	2.7
Disassemble processing equipment such as weigh tanks, clarifiers, pasteurizers, homogenizers, fillers, etc. for cleaning and sanitizing	73	2.7
Evaluate influence chlorine compounds have on dairy plant equipment metals	53	2.3
Identify improperly cleaned equipment	73	2.8
Identify various sources of milk contamination	66	2.7
Prepare cleaning and sanitizing solutions	69	2.7
Operate the clean-in-place system	69	2.7

TABLE VI (Cont.)

PERCENTAGE PERFORMANCE AND AVERAGE RATING OF IMPORTANCE OF SPECIFIC TASKS

TASK STATEMENTS	Percent Performing	Average Level of Importance
Post-rinse plant equipment parts	69	2.8
Sanitize the various parts	73	2.8
Set-up the clean-in-place system	73	2.8
Scrub parts of processing equipment	69	2.8
Mean Rating	67.6	2.7
Disposing of Wastes		
Discard leaking milk cans	29	1.8
Discard spoiled milk	59	2.5
Irrigate land with waste fluids	13	1.0
Pre-treat floor wastes	9	1.1
Prevent waste runoff	26	2.0
Collect waste samples	16	1.4
Install skimming baffle	13	1.2
Conduct tests on waste liquids	16	1.6
Sample wastes in proportion to flow	19	1.5
Mean Rating	22.2	1.6
Clarifying Raw Milk		
Check milk for complete removal of foreign particles	39	2.3
Check temperature of milk to be clarified	50	2.4
Determine causes of improper clarification	36	2.1
Determine when milk should enter clarifier	46	2.3
Mean Rating	42.7	2.3
Pasteurizing Milk		
Determine bacterial count of pasteurized milk	39	2.1
Determine causes of improper pasteurization	50	2.7
Determine coliform count of pasteurized milk	39	2.2
Determine holding time for pasteurization	50	2.4
Determine how pasteurization conditions vary between fluid milk and other milk products	39	2.3

TABLE VI (Cont.)

PERCENTAGE PERFORMANCE AND AVERAGE RATING OF IMPORTANCE OF SPECIFIC TASKS

TASK STATEMENTS	Percent Performing	Average Level of Importance
Determine phosphate limits per ml. for pasteurized milk. . . .	23	2.0
Determine what pasteurization factors may affect milk flavor .	39	2.2
Direct milk to pasteurizer	59	2.6
Follow precautions to avoid mixing of water with products or mixing one product with another.	69	2.8
Follow rapid cool-down procedures after pasteurization	59	2.7
Identify methods of pasteurization such as batch method, high temp.-short time (HTST) and ultra high temperature (UHT)	53	2.2
Determine milk temperature for pasteurization.	63	2.5
Mean Rating.	48.5	2.4
Homogenizing Milk		
Check temperature of milk to be homogenized.	56	2.6
Determine causes of improper homogenization.	53	2.6
Direct milk to homogenizer	60	2.6
Examine milk for proper homogenization	53	2.2
Mean Rating.	55.5	2.5
Separating Milk		
Check temperature of milk to be separated.	57	2.6
Determine causes of improper separation.	57	2.5
Direct milk to separators.	57	2.4
Distinguish between types of cream such as whipping cream, coffee cream, etc..	50	2.1
Mean Rating.	55.3	2.4
Packaging Milk and Dairy Products		
Check temperature of milk or dairy product	64	2.6
Determine causes of filling equipment failures	57	2.6
Determine package weight	64	2.8
Remove filled containers	46	2.2
Replenish paper fillers.	50	2.3
Supply cartons or bottles to filling equipment	50	2.3

TABLE VI (Cont.)

PERCENTAGE PERFORMANCE AND AVERAGE RATING OF IMPORTANCE OF SPECIFIC TASKS

TASK STATEMENTS	Percent Performing	Average Level of Importance
Mean Rating	55.2	2.5
Determining Milk Quality		
Determine bacteria count	46	2.2
Determine milk content	39	1.9
Determine total solids content	42	2.2
Identify flavor defects in milk	75	2.5
Identify various classes of milk	35	1.8
Identify various grades of milk	39	1.7
Make a methylene blue test	21	1.6
Make a sediment test	32	1.7
Perform acid test	57	2.3
Perform phosphatase test	14	1.5
Test milk for adulteration	32	1.9
Mean Rating	39.3	1.9
Preparing Ice Creams		
Add fruit to mix	14	1.4
Freeze ice cream	17	1.6
Pack ice cream	17	1.5
Prepare (mix) ice creams	17	1.6
Stack ice cream in hardening room	21	1.4
Mean Rating	17.2	1.5
Preparing Cultured Products		
Prepare buttermilk	46	1.9
Prepare cheese	21	1.4
Prepare cottage cheese	25	1.5
Prepare yogart	14	1.4
Mean Rating	26.5	1.6