

ASSESSMENT OF SOCIO-ECONOMIC CONDITIONS OF ICE-PLANT WORKERS IN SILUVAIPATTI AREA OF THOOTHUKUDI DISTRICT

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ABSTRACT

The ice-plant industry plays a crucial role in the fisheries and cold storage sector, providing essential support for seafood preservation and transportation. This study examines the socio-economic conditions of ice-plant workers in Siluvaipatti, a key industrial hub in Thoothukudi District, Tamil Nadu. The research explores various aspects, including demographic characteristics, income levels, working conditions, health and safety concerns, and the impact of employment on workers quality of life. Data were collected through field surveys and interviews with workers, highlighting the challenges they face, such as low wages, job insecurity, occupational hazards, and lack of social security measures. The findings suggest the need for policy interventions to improve working conditions, ensure fair wages, and implement safety regulations. Enhancing social security benefits and providing skill development programs could significantly improve the livelihoods of ice-plant workers.

Keywords

Ice-plant, ultraviolet, purification, compressor, condenser, expansion valve, evaporator, refrigeration system, ice crystals, fisheries industry, personal protective equipment (PPE) Lockout-tagout (LOTO).

Introduction

The demand for iceblock is as great today as it ever has been, despite advances made in the development of modern refrigeration equipment. Manufacture is used for producing refrigeration effect to freeze potable water in standard cans placed in rectangular tank which filled by brine. A good definition of refrigeration is the removal of heat energy so that a space or material is colder than its surroundings. An ice plant based on same principle as a simple refrigeration system. An ice plant contains various parts such as compressor, condenser, receiver, expansion valve, evaporator and refrigeration, accumulator. A refrigeration is always been a great deal for human being and play a vital role in preserving food, chemical, medicine,

fisheries and providing appropriate temperature in working entity of any industry . Refrigeration in the coming years becomes very essential deal for drastic development of the industrial sector. Our problem is an Ice plant that is next to our house in residential area. All neighbors are suffering from it. Ammonia leakage risks, noise pollution, commercial vehicles running around round the clock, disposal of its salt water caused burning of plants are some issues. Ice plant workers often face issues like exposure to extreme cold temperatures, potential hazards from ammonia leaks (a common refrigerant used in ice plants), repetitive strain injuries from manual handling of ice blocks, potential slips and falls on wet surfaces, and concerns regarding long working hours, particularly during peak demand periods. Working in consistently cold environments can lead to hypothermia, frostbite, and other cold-related health issues, especially when not properly dressed or with inadequate breaks.

Process of ice plant

Ice production often begins with the purification of water to remove pollutants and toxins. To create clean and clear water appropriate for ice manufacture, several filtering and treatment procedures, such as reverse osmosis or ultraviolet sterilization can be used. After purification, the water is held in a reservoir or tank particularly suited for ice production. The water is then fed into an ice maker or ice machine. Ice producers are made out of an insulated chamber and a refrigeration system.

A compressor, condenser, expansion valve, and evaporator comprise the refrigeration system. The compressor increases the temperature and pressure of a refrigerant gas by compressing it. The heated refrigerant gas then goes into the condenser, where it emits heat into the surrounding environment, causing it to cool and condense into a liquid.

An expansion valve decreases the pressure and temperature of the liquid refrigerant. This low-pressure, low-temperature refrigerant then enters the evaporator, where it absorbs heat from the water, dramatically lowering the water temperature. As a result, the water starts to freeze and turn into ice.

Mechanical agitators or revolving blades are often used by ice makers during the freezing process to avoid the creation of, favoring the manufacture of clean and compact ice cubes. Ice gradually accumulates and solidifies on the evaporator surface.

Types of Ice Plant Workers

Ice plants require a skilled workforce to ensure the efficient production, storage, and distribution of ice for various industrial and commercial applications. The workforce in an ice plant is diverse, with each category of worker performing specific tasks

crucial for the smooth operation of the facility. These workers can be classified into different types based on their roles and responsibilities, including

- Machine operators
- Maintenance technicians
- Quality control inspectors
- Packaging and handling staff
- logistics and delivery personnel
- Administrative and supervisory staff.

Each of these workers plays a significant role in ensuring that the ice production process runs efficiently and meets industry standards.

One of the most important types of workers in an ice plant is the machine operators. These individuals are responsible for running the ice-making machines, monitoring their performance, and ensuring that they function optimally. They oversee the ice production process, adjusting settings as necessary to produce ice in various forms, such as block ice, crushed ice, or tube ice, depending on the plant's requirements. Machine operators must have technical knowledge of the equipment, as they are responsible for troubleshooting minor issues and reporting any major malfunctions to the maintenance team. Without skilled machine operators, the production process would be inefficient and prone to frequent breakdowns, leading to delays and increased operational costs.

Another crucial category of ice plant workers is the maintenance technicians, who are responsible for the upkeep and repair of the machinery and refrigeration systems. Ice plants rely on heavy-duty equipment that operates continuously, and any technical failures can result in significant downtime. Maintenance technicians perform regular inspections, preventive maintenance, and emergency repairs to keep the machines running smoothly. They also handle refrigeration systems, ensuring that the cooling processes are efficient and that ice remains in the desired frozen state. Since ice production involves working with compressors, condensers, and evaporators, maintenance technicians must have expertise in refrigeration engineering and mechanical systems. Their role is critical in preventing unexpected breakdowns and ensuring the longevity of the equipment.

Safety Measures for Ice Plant Workers

Ice plants are essential in industries such as food preservation, fisheries, and cold storage. However, working in an ice plant involves exposure to extreme cold, hazardous machinery, and potential chemical leaks. To ensure the safety and well-being of workers, strict safety measures must be followed. These measures include proper protective equipment, safe handling of machinery, and prevention of ammonia leaks, training programs, and emergency preparedness.

Objectives of the study

1. To know the socio-economic conditions of the sample respondents
2. To know the various mode of payment.
3. To find out the health and safety measures available to workers.

Review of Literature

Occupational Safety and Health Administration (OSHA). (2022).Case studies of accidents in ice plants underscore the importance of proper training and machinery maintenance. OSHA (2022) reported that 45% of accidents could be prevented through adherence to lockout/tagout procedures and periodic inspections.

Wilson et al. (2022)studied the effectiveness of thermal gloves, jackets, and insulated footwear in reducing cold-related health issues. The study found that workers equipped with PPE experienced fewer cases of frostbite and hypothermia.

METHODOLOGY

The methodology adopted for the present investigation including selection of the respondents and objectives of the study together with source of data, sample, selection, period of study, scope and significance of the study and statistical tools used for data analysis.

PRIMARY DATA

To collecting primary data, through the schedule questionnaires have been distributed to the sample respondents to get information regarding the case study.

SECONDARY DATA

The secondary data also collected from various journals, books, newspaper, website etc.

SAMPLE SIZE

Forthe present study from the socio- economic conditions of ice- plant workers in siluvaipattiarea of thoothukudi district. Totally 130 sample respondents were selected by using simple random sampling method.

TOOLS FOR ANALYSIS

Based on the nature of data and relevance of information required, linear – regression and statistical tools like percentage, bar diagram and averages were used for the analysis of data.

PERIOD OF THE STUDY

This study period is November 2024 to March 2025.

ANALYSIS OF DATA

TABLE-1

Educational Qualification of the sample Respondents

S.NO	Educational Qualification	No of the Respondents	Percentage
1.	Primary school	8	7%
2.	Secondary school	86	66%
3.	Degree	13	10%
4.	Illiterate	23	17%
	Total	130	100%

Source: Primary data

This table reveals that educational qualifications among the respondents. 7% of the respondents completed their primary level, 66% of the respondents completed their secondary level, 10% of the respondents completed their degrees, and finally 17% of the respondents illiterate respectively.

Figure 1.1

Educational Qualification of the sample Respondents

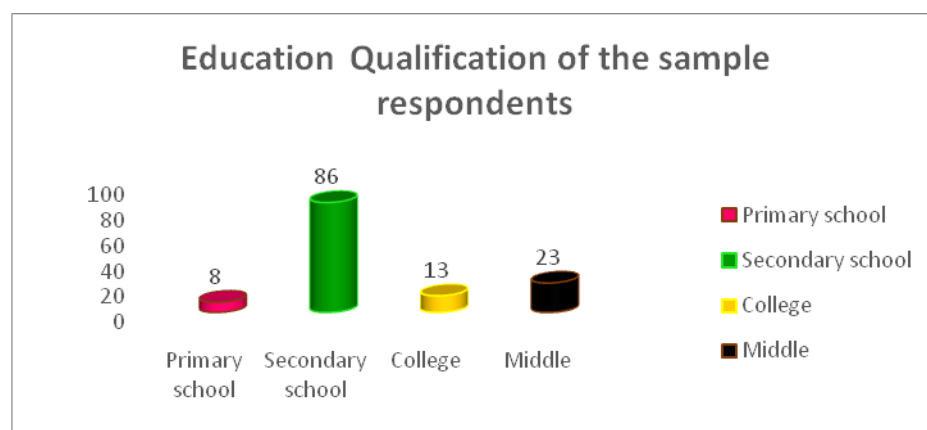
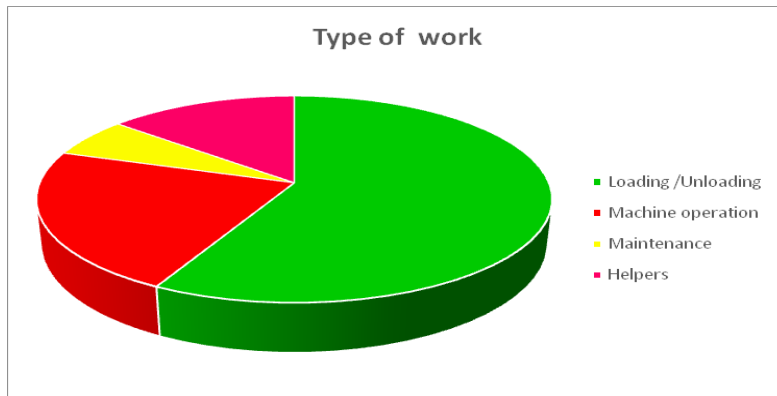


TABLE-2
Type of work among the respondents

S. No	Type of work	No of the Respondents	Percentage
1.	Loading /Unloading	75	57%
2.	Machine operation	29	22%
3.	Maintenance	8	7%
4.	Helpers	18	14%
	Total	130	100%

Source: Primary data

This table shows that the type of work of the respondents, 57% of the respondents work is loading /Unloading, 22% of the respondents working type is machine operation, 7% of the respondents work type is maintenance and 14% of the respondents work is helper respectively.

Figure -2.1
Type of work among the respondents

TABLE-3
Monthly Income of the respondents

S.No	Monthly Income	No of the Respondents	Percentage
1.	Below 8,000	8	7%
2.	8,000-12,000	13	10%
3.	12,000-15,000	99	76%
4.	Above 15,000	10	7%
	Total	130	100%

Source: Primary data

Out of 130 sample respondents 7% of the respondents earning their income below Rs.8,000, 10% of the respondents earning their income belongs to the

categories of Rs.8000 – Rs.12000, 76% of the respondents earning their income belongs to the categories of Rs.12000 – Rs.15000, finally 7% of the respondents earning their income above Rs.15,000 respectively.

Figure -3.1

Monthly Income of the respondents

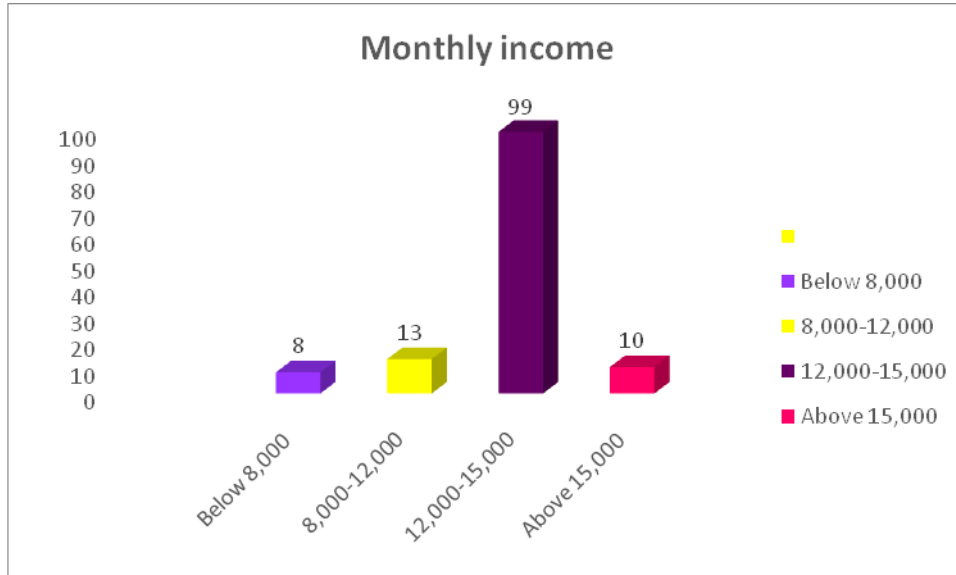


TABLE-4

Monthly Expenditure of the respondents

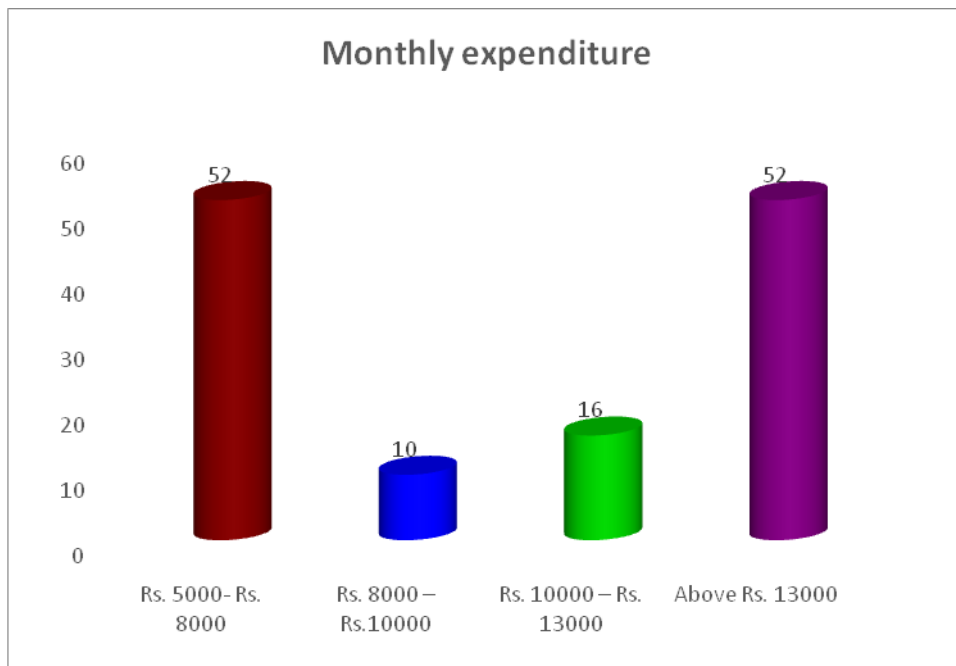
S. No	Expenditure	No of the respondents	Percentage
1.	Rs. 5000- Rs. 8000	52	40%
2.	Rs. 8000 – Rs.10000	10	8%
3.	Rs. 10000 – Rs. 13000	16	12%
4.	Above Rs. 13000	52	40%
	Total	130	100%

Source: Primary data

The table explains that monthly expenditure of the respondents. 40% of the respondents to spent between Rs. 5000 – Rs. 8000, 8% of the respondentstospent between Rs. 8000 – Rs. 10000, 12% of the respondents to spent between Rs. 10,000 – Rs. 13000,and 40% of the respondents spent above Rs. 13000 per month respectively.

Figure -4.1

Monthly Expenditure of the respondents



RELATIONSHIP BETWEEN MONTHLY INCOME AND EXPENDITURE OF THE SAMPLE RESPONDENTS

Linear - Regression:

The linear regression analysis of ice plant workers' income and expenditure suggests a negative relationship between the two variables. This indicates that as income increases, expenditure on basic needs does not rise proportionally. The hypothesis is thus proven. Households tend to have a higher rate of expenditure on basic needs relative to income increases. This conclusion implies that ice plant workers' income levels influence their changing lifestyle patterns.

The formula for linear regression is given by:

Results:

$$Y = a + bX$$

$$Y = 41.16 - 0.26X$$

The socio-economic conditions, particularly income and expenditure patterns, influence ice plant workers in the study area. In this analysis, the independent variable is the annual income of the respondents, while the dependent variable is their annual expenses. The regression analysis reveals the relationship between annual income and annual expenses within the study area.

FINDINGS

- ❖ Out of 130 sample respondents, the majority have completed their secondary school education.
- ❖ 57% of the respondents are engaged in loading and unloading work.
- ❖ 76% of the respondents monthly income between Rs. 12,000 and Rs. 15,000.
- ❖ 40% of the respondents monthly expenditure above Rs. 13,000.

SUGGESTIONS

- ❖ Provide insulated gloves, boots, and protective clothing to prevent cold-related injuries.
- ❖ Conduct regular safety training on handling ice-cutting tools and heavy machinery.
- ❖ Schedule frequent short breaks to prevent frostbite and hypothermia.
- ❖ Ensure proper ventilation to prevent respiratory issues from prolonged cold exposure.

CONCLUSION

Highlights several challenges faced by these workers in terms of income, job security, and working conditions. Most workers come from economically weaker sections and depend on daily wages, which are often inconsistent and inadequate to support their families. Many workers are engaged in physically demanding tasks such as ice cutting, lifting, and packing, which expose them to harsh working conditions, including extreme cold and high humidity. The seasonal nature of the industry further adds to their financial insecurity, making it difficult for them to sustain a stable livelihood throughout the year.

Health and safety concerns remain a major issue among ice plant workers. Prolonged exposure to cold storage environments leads to respiratory problems, joint pain, and other occupational health hazards. Most workers lack proper protective gear such as insulated gloves, boots, and warm clothing, increasing their vulnerability to work-related injuries. emergencies.



References

- ❖ Occupational Safety and Health Administration (OSHA). 2022 Accident prevention in ice plants. Retrieved from osha.gov.
- ❖ Wilson, M., et al 2022 PPE for occupational safety in cold environments. Occupational Medicine Journal, (1)33, .49-41