UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

DEHRADUN

SUMMER INTERNSHIP REPORT

ON

A MARKET RESEARCH SURVEY

"MARKET FEASIBILITY OF USING CRYOGENIC CYLINDERS IN THE REFRIGERATED AND INSULATED TRUCKS FOR FISH TRANSPORT"

AT VISHAKHAPATNAM

FOR INDIAN OIL CORPORATION LIMITED, NASIK

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT

OF THE DEGREE OF

MBA (Oil & Gas)

Internal Mentor: R. Yagnik
Professor
Department of Oil & Gas
UPES, Dehradun, Uttarakhand

External Mentor: K.Gururaj
Chief Manager (TS)
Business Group (Cryogenics)
IOCL, Nasik, Maharashtra

Submitted By: VISHNU NARAYANAN.S

MBA (O&G)
UPES, Dehradun
SAP ID: 500021021
ROLL NO: R020212064
August, 2013

ACKNOWLEDGEMENT

I would like to express my gratitude to all those who gave us the possibility to complete this training. I want to thank the department of Business Group, Cryogenic Department of Indian Oil Corporation Limited for providing us enough knowledge and details regarding the Cryogenic Applications and further allowing me to commence this training in Andhra Pradesh. I would furthermore like to thank the officers of production, quality and management department for helping me in knowing about the product specifications, plant layout and production process. It has been a great opportunity for me to undergo my summer internship with Indian Oil Corporation Limited, Nasik.

It is my privilege to acknowledge the kindness and helpfulness of **Mr. Satwant Singh** (Executive Director) & **Mr. K. Gururaj** (Chief Manager – TS) and **Mr. R. Yagnik** (College Guide/Mentor). It is because of their inspiration, constructive criticism and valuable suggestions helped me to complete my summer internship project and added up knowledge regarding Cryogenics. Their precious guidance and unrelenting support kept me on track through my project work. I thank all the colleagues, who joined IOCL, Nasik for their summer internship, for their warm support and co-operation in successful planning and completion of project work.

VISHNU NARAYANAN.S
Student: M.B.A (Oil & Gas Management)
SAP ID: 500021021
ROLL NO: R02012064
UPES, DEHRADUN

DECLARATION

I, **Vishnu Narayanan S**, to the best of my knowledge, hereby declare that the project report entitled: *"A Market Research Survey,* **"Market Feasibility of using Cryogenic Cylinders in the refrigerated and insulated trucks for fish transport"**is the result of authentic record of my own work in the fulfillment of academic requirement. The training is done for Indian Oil Corporation Limited (IOCL) [Business Group (Cryogenics), Nasik] for a period of two months, dated, May 19, 2013 to July 19, 2013. The project work is carried out at four cities of Andhra Pradesh namely: Visakhapatanam, Bheemavaram, Gajuwaka and Narayanavaram. This project report is submitted to University of Petroleum & Energy Studies, Dehradun as well as to Business Group (Cryogenics), Indian Oil Corporation Limited, Nasik.

The matter presented in this report has been completely formulated by myself under the supervision of Project Coordinator/Supervisor, **Mr. K Gururaj,** *Chief Manager (TS), Indian Oil Corporation Limited, Nasik* and **Mr. Satwant Singh,** *Executive Director, Indian Oil Corporation Limited, Nasik.*

Signature of the Student

This is to certify that the above statement made by the candidate is correct to the best of my/our knowledge

Signature of the Coordinator/Supervisor

Place : **Nasik**

Date : **19.07.2013**

इंडियन ऑयल कार्पोरेशन लिमिटेड
ए-4, एम आय डी सी इन्ड्रस्ट्रीयल एरिया अंबड,
नाशिक-422 010 (भारत)
दूरभाष : 91-253-2382032 / 2382132
फैक्स : 91-253-2382362

Indian Oil Corporation Limited
A-4, MIDC Industrial Area, Ambad,
Nasik - 422 010 (India)
Phone : 91-253-2382032 / 2382132
Fax : 91-253-2382362

(आई बी पी डिविजन / IBP Division)
व्यवसाय समूह (क्रायोजेनिक्स) / BG (Cryogenics)

REF : BGC/HR/2013-14

19.07.2013

TO WHOM SO EVER IT MAY CONCERN

This is to certify that Vishnu Narayanan S, student of MBA Oil and Gas Management, University of Petroleum and Energy Studies, Dehradun has successfully completed his training in IOCL Business Group (Cryogenics),Nasik from 19.05.2013 to 19.07.2013. His overall conduct and performance during the training was found to be good.

We wish him all success in his career.

Business Group (Cryo)
Indian Oil Corporation Limited

D.D. GAIDHANI
SR. MANAGER (HR)

EXECUTIVE SUMMARY

This report presents a detailed analysis of the survey carried out under the heading of ""*A Market Research Survey,* "**Market Feasibility of using Cryogenic Cylinders in the refrigerated and insulated trucks for fish transport**"" at 4 cities namely Visakhapatanam, Bheemavaram, Gajuwaja, Narayanavaram in Andhra Pradesh.

The analysis was made after the market survey which was done with the aid of Questionnaire, Schedules and Interviews. The presented report is based on the Summer Internship carried out by us with Indian Oil Corporation Limited, Nasik.

The plant of IOCL at Nasik deals with the manufacturing of Cryogenic Equipment. IOCL (Cryogenic Division, Nasik) has proposed a new product named Cryogenic Cylinder which has a capacity of 420 and 620 litres each which can run for 18 and 26 hours each. IOCL needed a survey to be carried out in a place from which fish/seafood is transported to various cities in the country. Hence Visakhapatanam and Bheemavaram were chosen. The entire report depicts the responses and attitude of the people being enquired at various Export companies, Transport companies, Ice factories etc during our Summer Internship Program.

CONTENTS

LIST OF TABLES AND CHARTS

Table no **Page no.**

Chart No **Page No**

List of figures:

Figure **Page no.**

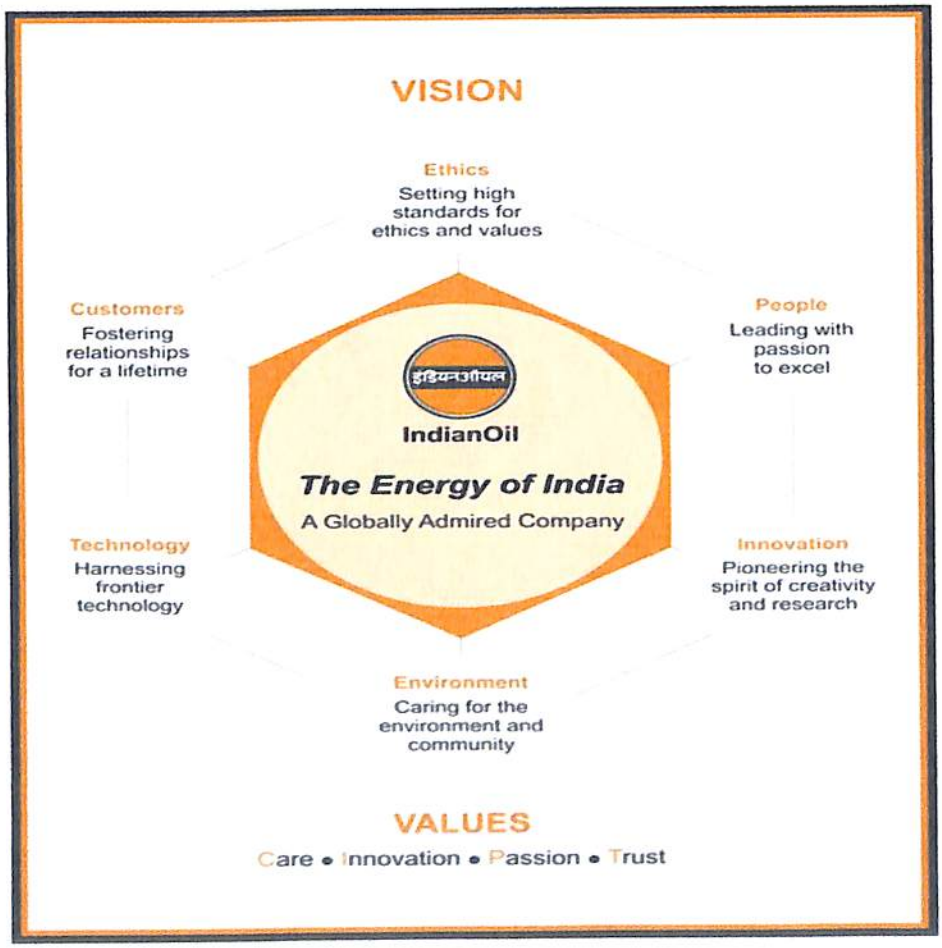
1. Indian Oil Corporation Limited

Indian Oil Corporation Limited (IOCL) is a public sector, Oil and Gas Corporation of India, owned by the state. IOCL has it's headquarter at New Delhi, India. According to Fortune Global 500 list, IOCL is one of the world's largest public corporations. IOCL is the largest public sector corporation in terms of revenue generation in India. Indian Oil and its subsidiaries account for a 49% share in the petroleum products market, 31% share in refining capacity and 67% downstream sector pipelines capacity in India. The Indian Oil Group of Companies owns and operates 10 of India's 22 refineries. The President of India owns 78.92 % (1.9162 billion shares) in the company.

In FY 2012, IOCL sold 75.66 million tonnes of petroleum products and reported a PBT of ₹37.54 billion, and the Govt. of India earned an excise duty of ₹232.53 billion and tax of ₹10.68 billion.

It is one of the seven companies of India, from Coal India Limited, NTPC Limited, ONGC, Steel Authority of India Limited, Bharat Heavy Electricals Limited and GAIL who has been awarded the status of Maharatna.

1.1 Vision and Values



Values

Indian Oil nurtures the core values of Care, Innovation, Passion and Trust across the organization in over to deliver value to its stakeholder

Care comprises of:

- Concern
- Empathy
- Understanding
- Co-operation
- Empowerment

Innovation comprises of:

- Creativity
- Ability to learn
- Flexibility
- Change

Passion comprises of:

- Commitment
- Dedication
- Pride
- Inspiration
- Ownership
- Zeal & Zest

Trust comprises of:

- Delivered promises
- Reliability
- Dependability
- Integrity
- Truthfulness
- Transparent

1.2 Objectives & Obligations

- To serve the national interests in oil and related sectors in accordance and consistent with Government policies.
- To ensure maintenance of continuous and smooth supplies of petroleum products by way of crude oil refining, transportation and marketing activities and to provide appropriate assistance to consumers to conserve and use petroleum products efficiently.
- To enhance the country's self-sufficiency in crude oil refining and build expertise in laying of crude oil and petroleum product pipelines.
- To further enhance marketing infrastructure and reseller network for providing assured service to customers throughout the country.
- To create a strong research & development base in refinery processes, product formulations, pipeline transportation and alternative fuels with a view to minimizing/eliminating imports and to have next generation products.
- To optimise utilisation of refining capacity and maximize distillate yield and gross refining margin.
- To maximize utilization of the existing facilities for improving efficiency and increasing productivity.
- To minimize fuel consumption and hydrocarbon loss in refineries and stock loss in marketing operations to effect energy conservation.
- To earn a reasonable rate of return on investment.
- To avail of all viable opportunities, both national and global, arising out of the Government of India's policy of liberalization and reforms.
- To achieve higher growth through mergers, acquisitions, integration and diversification by harnessing new business opportunities in oil exploration & production, petrochemicals, natural gas and downstream opportunities overseas.
- To inculcate strong 'core values' among the employees and continuously update skill sets for full exploitation of the new business opportunities.
- To develop operational synergies with subsidiaries and joint ventures and continuously engage across the hydrocarbon value chain for the benefit of society at large.

1.3 Financial Objectives

- To ensure adequate return on the capital employed and maintain a reasonable annual dividend on equity capital.
- To ensure maximum economy in expenditure.
- To manage and operate all facilities in an efficient manner so as to generate adequate internal resources to meet revenue cost and requirements for project investment, without budgetary support.
- To develop long-term corporate plans to provide for adequate growth of the Corporation's business.
- To reduce the cost of production of petroleum products by means of systematic cost control measures and thereby sustain market leadership through cost competitiveness.
- To complete all planned projects within the scheduled time and approved cost.

1.4 Obligations

- **Towards customers and dealers**: To provide prompt, courteous and efficient service and quality products at competitive prices.
- **Towards suppliers**: To ensure prompt dealings with integrity, impartiality and courtesy and help promote ancillary industries.
- **Towards employees**: To develop their capabilities and facilitate their advancement through appropriate training and career planning. To have fair dealings with recognised representatives of employees in pursuance of healthy industrial relations practices and sound personnel policies.
- **Towards community**: To develop techno-economically viable and environment-friendly products. To maintain the highest standards in respect of safety, environment protection and occupational health at all production units.
- **Towards Defense Services**: To maintain adequate supplies to Defense and other para-military services during normal as well as emergency situations.

1.5 Major Projects @ Indian Oil Corporation Limited

1. **Integrated Crude Oil Handling Facilities @ Paradip.**

   Project Cost: Rs. 1492.33 Crores.
   Brief Description: The proposal is for installation of 2nd SPM for Paradip Refinery and 3rd SPM & sub-sea crude oil transfer pipeline with associated facilities as a part of Integrated Offshore Crude Handling Facilities at Paradip.

2. **Revamp of FCC Unit @ Mathura**

   Project Cost: Rs. 1000.00 Crores.
   Brief Description: Project consists of Revamp of Reactor – Regenerator Section, Third Stage Separator (TSS) for reduction of particulate emission, modification in the Gas-Con Section and the OSBL (outside battery limit), Revamp of existing Propylene Recovery Unit (PRU) and other related facilities.

3. **Grassroots Refinery Project @ Paradip (Orissa)**

   Project Cost: Rs. 29,777.00 Crores.
   Brief Description: A 15 MMTPA refinery is being constructed at Paradip in Orissa. The refinery will have, apart from a Crude and Vacuum Distillation Unit, a Hydro-cracking Unit, a Delayed Coker Unit and other secondary processing facilities. This will be the most modern refinery in India with a nil-residue production, and the products would meet stringent specifications. Indian Oil has taken over 3344 acres of land for the project and necessary infrastructure development jobs prior to setting up of the main refinery are in progress.

4. **Paradip-Raipur-Ranchi Pipeline**

Project Cost: Rs. 1793.60 Crores.
Brief Description: Project consists of laying of 1108 km long product pipeline with intermediate pumping stations at Jatni and New Sambalpur and delivery stations at Jatni, Jharsuguda, Ranchi, Raipur and Korba. The pipeline will be having a telescopic diameter of 18"/14"/12"/10" OD.

5. **De-Bottlenecking Of Salaya-Mathura Crude Pipeline**

Project Cost: Rs. 1584.00 crores.
Brief Description: The proposal is for enhancing the capacity of Salaya-Viramgam section from 21 MMTPA to 25.0 MMTPA, [Viramgam-Koyali section from 8.5 MMTPA to 9.0 MMTPA, Viramgam-Chaksu section from 13.5 MMTPA to 16.5 MMTPA, Chaksu-Mathura section from 7.5 MMTPA to 9.2 MMTPA and Chaksu-Panipat section from 6 MMTPA to 7.3 MMTPA].

Other Major projects include: Paradip-Haldia-Durgapur LPG Pipeline, Augmentation of Paradip-Haldia-Barauni Crude Oil Pipeline and Business Group (Cryogenics) at Nasik.

1.6 IOCL IBP DIVISION

Indian Oil Corporation-IBP Division was formed after the merger between two companies.

IBP Co. Limited merged with 'Indian Oil Corporation Limited' on 02-05-2007 under the Ministry of Petroleum & Natural Gas, Government of India. As a result of which the history of 98 year old 'IBP Co Limited', the oldest oil company in India ended.

IBP was founded by Abdul Karim Abdul Shakur Jamal under the name of Jamal's oil Company limited and it was renamed as Indo-Burma Petroleum Company limited in 1909.

IBP Co. Limited started during the undivided British India as "Indo-Burma Petroleum Company Limited" a joint stock private company on 08-02-1909 at Burma, presently Myanmar.

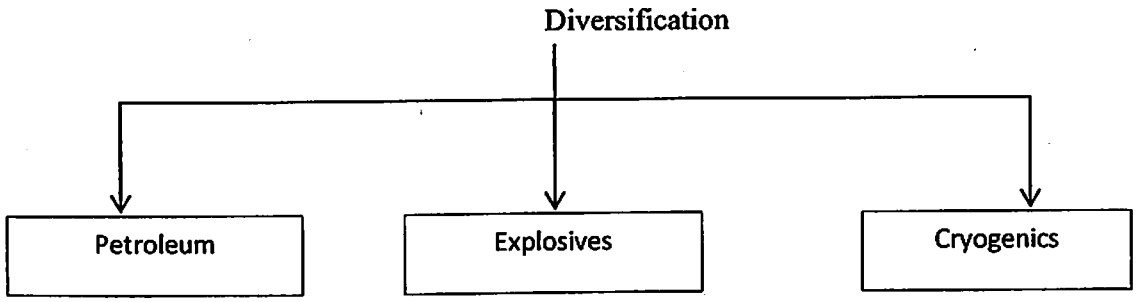
The developments after the Second World War led the company to change its headquarters to Kolkata as British Government destroyed its only refinery at Rangoon. After that the company joined with the then Indian Oil Company to carry out business in petroleum products at Mumbai and Kolkata.

- IBP was initially taken over by IOC in 1970,
- Then got separated and formed as a public sector company in 1974 under the Ministry of Petroleum and Natural Gas, Government of India. By this time all the foreign private oil businesses were nationalized and made public sector companies. The Indo Burma Petroleum Company Limited changed its name to IBP Co. Limited in 1983.

- In 2002, IBP was once again acquired by the IOC and became one if its group companies.

- Headquarters : Kolkata, India
- Key people : Satwant Singh (Executive Director)
- Type : PSU

IBP was mostly an oil company; IBP diversified its activities into engineering and chemicals.



1.7 EXPLOSIVES:

The diversification to explosives by the chemical division was done with suggestion from the Govt of India as the country was facing shortage of explosives for mining industry. So to avoid import of huge quantities of explosives to meet consumption alternative was taken. The recommendation of Chary committee was to set up a company in public sector for manufacture of explosives. IBP capitalized on this the opportunity and started its business in manufacture and marketing of industrial explosives

- IBP set up its first packaged slurry explosive manufacturing plant in Korba in the year 1976 under the collaboration from Ireco Inc. USA.
- The unit commenced its commercial production in August 1977.
- Business was into a unique technology 'the bulk delivered slurry explosives' with the first ever plant of its kind set up in India at Kudremukh with a capacity of 5000 Tons per annum in 1980.
- The first ever supply of site-mixed bulk slurry explosives took place on 20-12-1980 in a blast using 63 tons of this product.
- Over the past 25 years, by 20th Dec 2005 it has completed supply of 64,695 MT of SMS explosives to Kudremukh Iron Ore Project.

2. CRYOGENICS DIVISION:

Indian Oil Corporation IOC –IBP Division started it business in cryogenics. It set up its plant at

- Nasik unit started in 1980
- Technology received for 3-4 models of Cryocan
- Adapted & pioneered the technology for full product range of over a dozen models
- Contributed humbly in White Revolution enabling India to become the largest MILK producer in the world
- Ventured into specialized technological areas of vacuum & cryogenic engineering.
- Executed projects of National importance to esteemed clients like DRDO (missile testing), ISRO (satellite testing & simulation), BARC, NFC etc.

Ushered latest technologies into India like high vacuum metallising, lyophilisers, vacuum brazing, solar etc.Company started production of

- Cryocans(CC)
- Industrial Containers (IC)
- LNGG Vessel
- Special vessels for refinery usage

Table 1: Different products range

Description	CC	IC	LNG	Refinery
Capacity	BA 1 L to 42L TA 1.5L to 55L	Storage 100L to 127,000L Transport 5 00L to23 KL Gas delivery systems	LNG Storage Tanks 114KL Transport Tankers 40KL Regassification systems	Grease kettle, Pressure Vessels, LIN Vessels
End Use	Storage and transport of Biological Products. Transport of LIN	Storage and transport of LIN, LOX, LAR etc	Storage and transport of LNG	Refinery, Lubes
Customers	AH, Infertility Clinics, Labs. Etc.	Gas Ind, Steel Ind.AH,Defence,Petrochemicals,Space research etc.	IOCL,LNG users	Refineries

When "Operation Flood" (a program to produce more milk in the country) was introduced in India, new technology from the Western world was adopted.

- It was to store bull's semen in liquid nitrogen containers.
- The temperature of liquid nitrogen is minus 196 degrees Celsius. The liquid nitrogen containers are similar to thermos flasks used for storing hot water, but have advanced insulation technology to keep the liquid nitrogen cool at minus 196 degrees Celsius.

For a long time, IBP was the only company manufacturing this technology item in India. Only recently has a private player entered the market. IBP is the market leader.

2.1 CRYOGENIC PRODUCTS DESCRIPTION:

2.1.1 CRYOCAN: A synonym of cryogenic container. It is also known as liquid Nitrogen container which is used for ultra low temperature preservation of semen for artificial insemination of cattle, storage of biological samples for medical research application as well as low volume transportation of liquid nitrogen.

- Unpressurised Aluminum LN2 containers(1 ltr to 55 ltr)
- Standardized models
- Developed in house design standards based on initial technical collaboration with Air Liquid.
- Capability to undertake new designs as per market requirements.
- Process broadly involves structural designing of inner and outer vessel, thermal, MLSI, vacuum retention etc.
- Design validation through prototyping and lab/field testing.

Indian Oil Corporation IOC –IBP Division is the

- Largest manufacturer in India
- Third largest in world

for the manufacturing of cryogenic containers.

With help of Cryocan, company has helped in the White revolution success. Main users of Cryocans are:

1. Government animal husbandry departments
2. Livestock development boards of various states
3. Milk producers unions
4. National dairy development board
5. NGO
6. Bhabha Atomic Research Center
7. Space application center
8. Center for advanced technologies
9. Medical research institutes
10. Cancer research centers
11. Infertility clinics
12. Engineering industry

IOC-IBP division has also developed industrial containers called "Cryovessel". It has been done to meet growing demand from

- Gas industry
- Animal husbandry
- Steel & other industry

Main application of Cryocans area:

1. Liquid nitrogen transportation
2. Portable door to door insemination
3. Bulk storage
4. Infertility clinics
5. Stem cells
6. Cell immunology
7. Low temperature metal analysis
8. Bull semen preservation
9. Shrink fitting
10. Vaccine preservation

Fig 1: Different sizes of cryocan

2.1.2 DESIGN:

Design of cryogenic equipment have been done to avoid losses as

- Conduction
- Convection
- Radiation

To avoid conduction, FRP neck is provided

To avoid convection, Vacuum is maintained between inner and outer vessl.

To avoid radiation, special aluminum and fiber glass paper is wrapped on inner vessel outer layer.

Various sections of ASME Code are as given below:

1. ASME section I: Rules for construction of power Boilers.

2. ASME section II:

Part A: ferrous material specifications

Part B: Non Ferrous material Specifications

Part c: Specifications for welding rods, electrodes and filler metals.

Part D: properties (customary)

Part D: properties (Metric)

3. ASME section III: Rules for construction of nuclear facility Components.

4. ASME section IV: Rules for construction of heating boilers.

5. ASME Section V: nondestructive examination.

6. ASME Section VI: Recommended rules for care and operation of heating boilers.

7. ASME section VII: Recommended guidelines for care of power boilers.

8. ASME Section VIII:

Division 1: Rules for construction of pressure vessel.

Division 2: Alternative Rules.

Division 3: Alternative rules for construction of high pressure vessel.

9. ASME Section IX: Welding and Brazing Qualifications.

10. ASME section X: Fiber reinforced Plastic pressure Vessel.

11. ASME Section XI: Rules for inservice inspection of Nuclear power plant components.

12. ASME section XII: Rules for construction and continued service of transport Tank.

EN Code

EN code: European nation's Code.

EN 13458-2: Code for cryogenic storage vessels.

EN 13530-2: Code for cryogenic transport vessels.

For EN 13458-2 For Inner vessel with weld joint efficiency 1

Long seam: Radiography (RT) is 100 percent.

Circumferential seam: 25 percent.

T Joint: Radiography 100 Percent.

IS code: IS 2825

For inner vessel with weld joint efficiency 1

Long seam: Radiography (RT) is 100 Percent.

Circumferential seams: 100 Percent.

T joints: Radiography 100 percent.

Various MOC for inner vessel: SS 304, SS304L, SS316, SS304LN.

For outer vessel can be designed as per ASME/ CGA/ EN code.

Major type of insulation:

MLSI: Multi-layer super Insulation.

Perlite: perlite powder is generally used for bigger vessel.

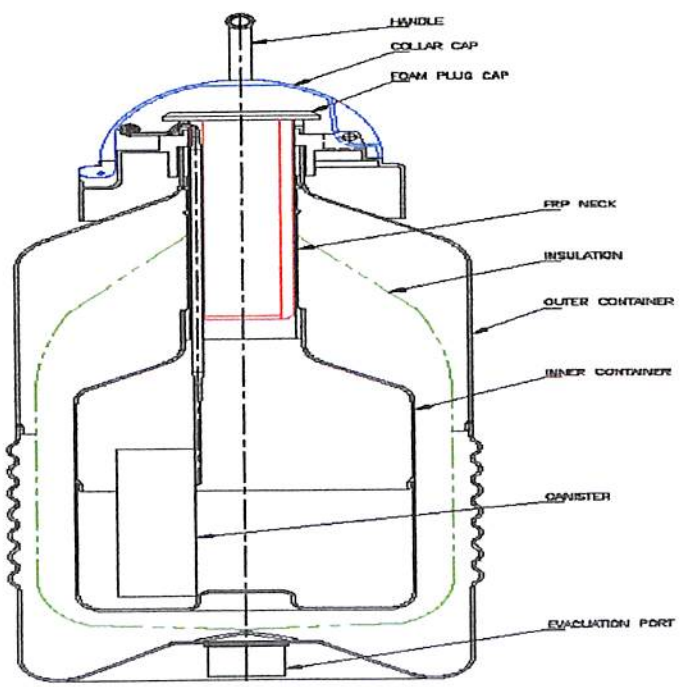


Fig 2: Inner diagram of cryocan

2.1.3 CRYOCAN SPECIFICATIONS

Table 2: Biological Cryocan size

		BIOLOGICAL										
		PORTABLE					STORAGE					
MODEL	UNIT	DS 1	BA1 .5	BA2 X	BA3	BA7	BA1 1	BA2 0	BA 23	BA3 5	BA4 2	J12
Capacity LN2	Lts	0.9	1.5	2.2	3.9	7.9	11.6	20.5	23. 5	33.3	41.4	47.3
Empty weight	Kgs	2.1	2.2	2.1	3.3	5.5	6.5	11.0	11. 2	14.6	16.5	15.9
Full weight	Kgs	2.8	3.4	3.9	6.4	11.9	15.9	27.5	30. 2	41.5	49.9	54.1
Neck dia	mm	30	30	51	51	51	51	51	90	51	70	120
Outer dia	mm	175	175	175	220	300	300	400	460	460	460	460
Total height	mm	407.	407	355	500	556	610	692	445	685	698	700
Static evaporation loss rate	Lts/day	0.097	0.097	0.125	0.135	0.135	0.14	0.118	0.35	0.118	0.21	0.38
Static holding time	Days	9	15	18	29	58	83	174	67	282	197	124
Canister OD	mm	26	17	38	38	38	38	38	68	38	56	72
Canister height	mm	120	120	120	120	120	120/280	120/280	120	120/280	280	280
No. of canisters	No.	1	5	6	6	6	6	6	9	6	7	11

Table 3: Transport cryocan size

		TRANSPORT			
MODEL	UNIT	TA1.5	TA 26	TA 35	TA 55
Capacity LN2	Lts	1.5	25.5	33.3	51.5
Empty weight	Kgs	2.2	11.6	12.8	15
Full weight	Kgs	3.4	32.2	39.7	56.6
Neck dia	mm	30	51	51	51
Outer dia	mm	175	400	460	460
Total height	mm	407	720	640	757
Static evaporation loss rate	Lts/day	0.097	0.25	0.3	0.43
Static holding time	Days	15	102	111	120
Canister OD	mm	26	-	-	-
Canister height	mm	120	-	-	-
No. of canisters	No.	1	-	-	-

2.2 CRYOVESSEL: These are larger capacity pressurized cryogenic containers.

- Inner layers SS and
- Outer Layer CS/SS
- Standard models- 110 Ltr to 950 Ltr Upto 10 KL @ 2 Bar pressure.
- Custom built models- Upto 150 KL and MAWP 22 Bar.
- Designed as per ASME/EN/IS codes &confirming to SMPV rules.

The process broadly involves structural designing of inner and outer vessel, supports, thermal, insulation (MLSI/perlite) piping (annular and external),valves and gauges, saddles, vacuum retention etc.

For design, approval has to get from PESO approved TPI(Third Party Inspection) agencies.

The validation is done through NDT tests Viz.

- Hydro test
- MSLD,
- Vacuum retention
- NER

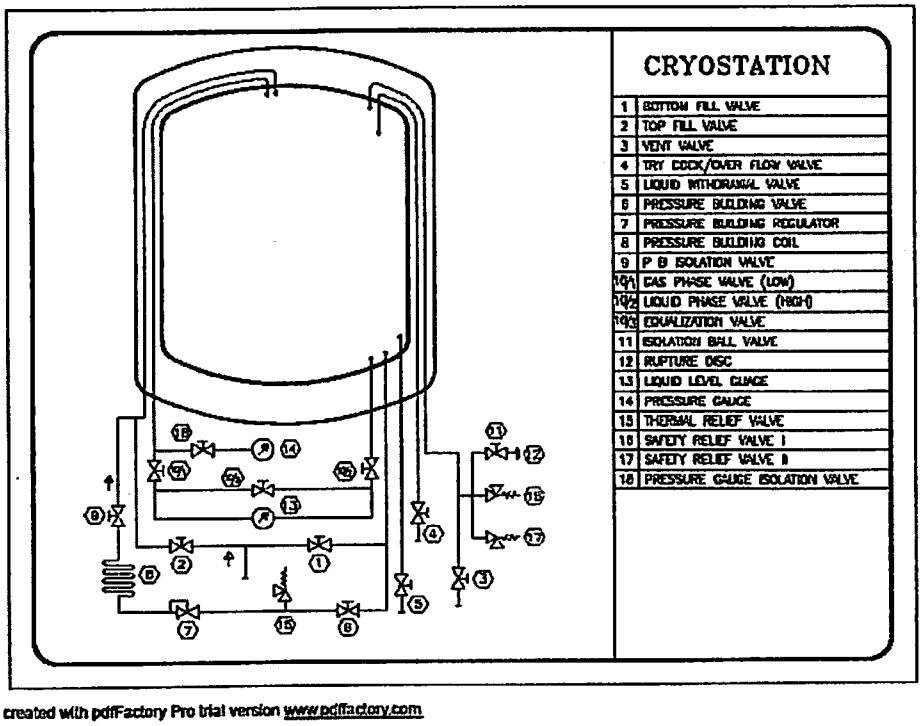


Fig 3: Cryovessel

Table 4 : Vessel specifications

Model	VLP-950
Net capacity in ltrs	940
Gross capacity in ltrs	995
Overall length in mm	2645
Outer dia of vessel in mm	1100
Empty weight in kg	715
Full weight in kg	1474
Max allowable working pressure in kg/cm2	3.3
Static evaporation rate for LN2 as %	0.75
Material of construction inner/outer	SS304/ CS
Transfer hose	15NB x 2mts long

2.3 LNG Vessels and Systems: Company makes special LNG vessel mostly used to supply LNG from the LNG tank to the consumers.

- Capacities upto 40 KL transport vessels and 150 KL storage vessels.
- Design as per ASME/EN codes(Flammable fluids)
- Design involves additional operational and safety requirements.
- Capability to provide complete solution including PLC /SCADA based regasification system.

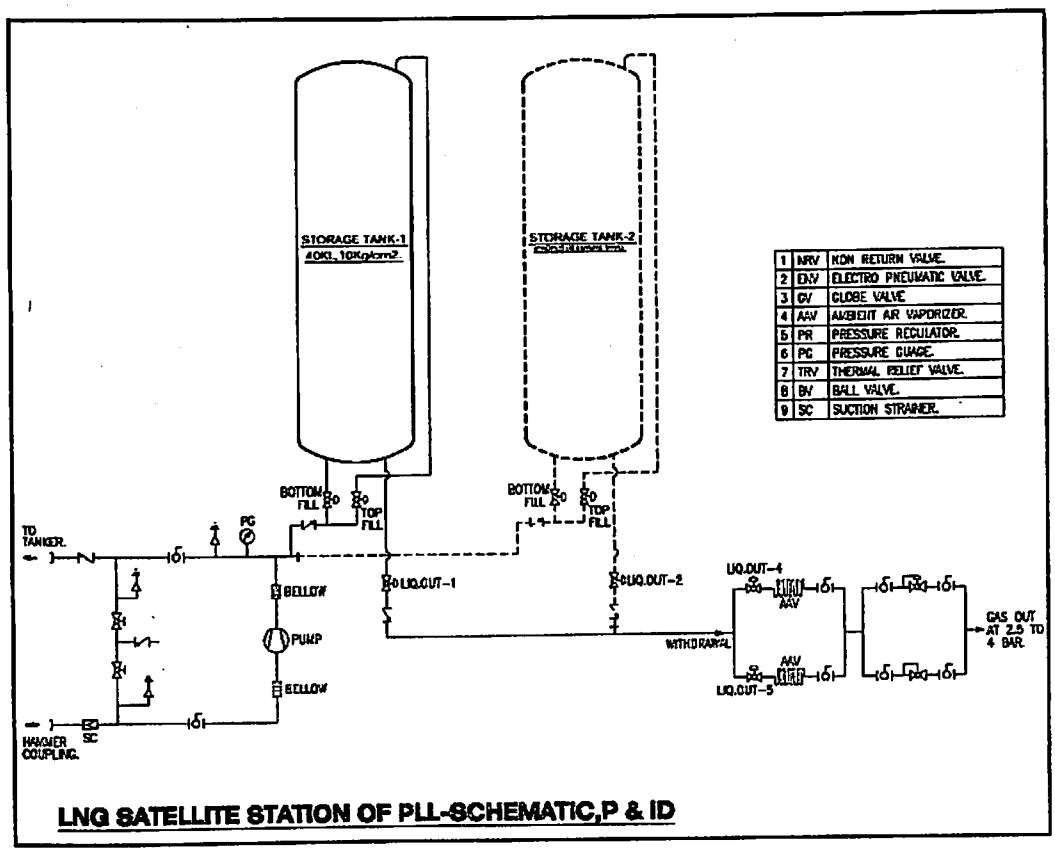


Fig 4: LNG tank operational diagram

Fig5: LNG System at Hindustan National Glass, Sinnar (commissioned)

Fig 6: LNG transport tanker under dispatch

3. BUSINESS TURNOVER:

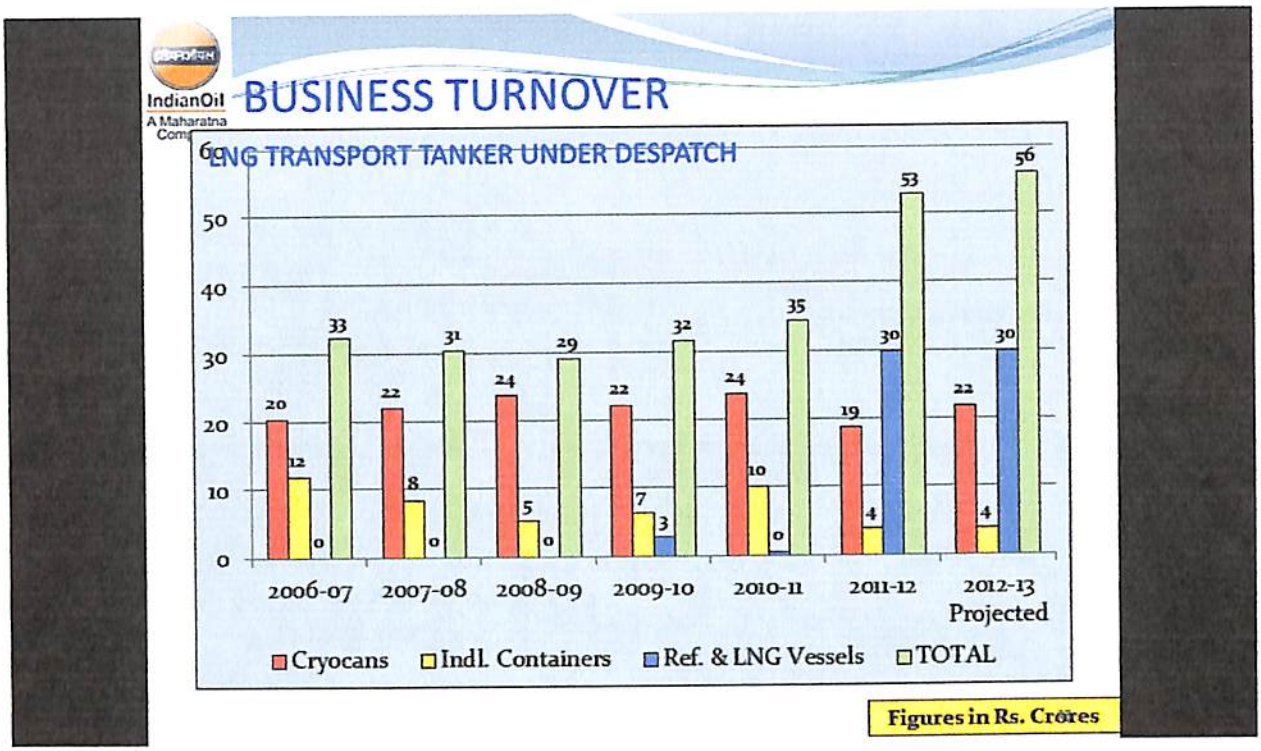


Fig 7: Company turnover

3.1 SIGNIFICANT ACHIEVEMENTS

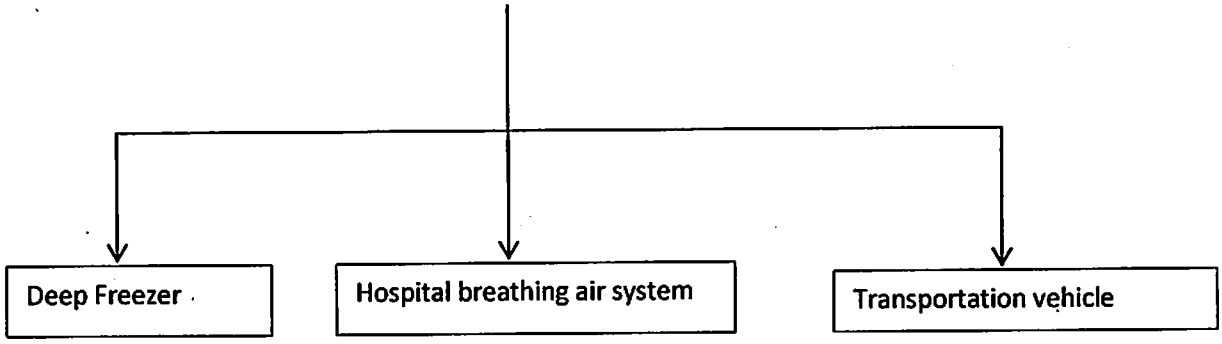
- First LNG Tanker in India (40 KL) rolled out.
- Largest LNG Storage Tank in India (114 KL) delivered.
- 5 Nos. 127 Kl Storage Tank for Paradip Refinery built to international standards.
- Specific energy consumption reduced to 17.6 from 21 kwh/cc .
- 655 Cryocans exported as against 185 last year.
- Offered total solution for LNG system.
- Unserviceable imported LNG Tankers repaired and tested with in-house skills.

3.2 FUTURE PLANS: The cryogenic division has many projects in plans. Some of them are:

- Cold stretch technology with in-house expertise. This can result in reduction of SS cost by about 30%.
- On Board LNG fuel tanks for Railways. Preliminary design completed. Awaiting clearance from Gas group to proceed.
- Oxygen delivery system (NMRL)
- Large project involving land based systems and marine vessels. L&T is roped in for support system.

Along with the above mentioned, for our summer internship company, has provided us task for the market research for three new products which they are going to launch.

The three main projects based on cryogenic applications are:



In all the three projects, the same cryogenic system will work but their application will be different.

"Cryogenics" word is derived from Greek and means "production of freezing cold"
"The branch of Physics and Engineering that involve the study of very low temperatures, how to produce them, and how material behaves at those temperatures."
It defines temperature scale below -150°C.
Application of cryogenics used for
Nitrogen at -196 °C
Oxygen at -183 °C
Argon at - 185.9 °C

Our project is based on nitrogen based refrigeration. Cryogenic cylinders which can stores liquid nitrogen is used as a refrigerating system in transport trucks. Cryogenic based refrigeration in transport sector is very much popular in foreign countries. So it technical feasibility is not a question. But it is not that popular in India. Now IOCL is the first company which has come up with such an idea to implement it in the market.

Some of the characteristics of this product are:

Uniform cooling - It provides uniform cooling for the material stored in the container. Here we will be focusing on fish which is being transported. The main advantage will be that the quantity of fish which is being damaged during transportation will be reduced to a large extend.

No moving parts- usually refrigeration system which is being used contains a lot of moving parts. Due to this the efficiency of vehicle will reduce to a very large extend. This will also increase the maintenance cost of the vehicle. The down time of the vehicle will be very high considering this aspect. Whereas when it comes to cryogenics it doesn't have any moving parts that mean it doesn't affect the vehicle's performance in any manner. This will reduce the maintenance cost of the vehicle to a large extend.

Quick freezing- temperature of -18 degree Celsius can be achieved within 30 minutes by nitrogen based refrigeration system, compared to 3 hours by the normal refrigeration system. This means that the temperature achievement by cryogenic based refrigeration system is very fast. This will help to keep the fish I good condition

Environmental friendly- This is the other major advantage of the refrigeration system. The diesel based refrigeration which is commonly under use creates a lot of pollution. Whereas nitrogen based refrigeration is very much environmental friendly.

So mainly the feasibility and market opportunity of this product is analyzed. This will be done by first studying the current fish transportation in Vishakhapatnam.

4. INTRODUCTION

The project is aimed to study the existing cold chain i.e mainly the fish transportation from Visakhapatnam to different parts of the country. Then after analyzing the current scenario the scope of application of cryogenics is checked. The technical and financial aspect of the project is analyzed. The technical aspects will include what all changes are to be made to the current technology in order to implement cryogenics. The technical benefits such as decrease in maintenance, improvement in performance, uniform cooling and all the other major advantages will be closely analyzed. The financial aspect will be mainly focused on high cost of cryogenics. The main objective of financial analysis will be to calculate the return on investment. This is because the minimum expected cost of cryogenic cylinders will be at least eight lakhs. So within what period the customer will be able to recover this amount is to be found out. For finding this the reduction in damage of fish, increase in quantity of fish, reduction in ice is taken into consideration.

Currently the fish transportation is mainly dependent on ice and refrigeration systems. They are not much effective; nearly 20% of fish gets damaged. Then the use of ice is very high and it consumes nearly 50% of the total capacity of the container used for transportation. Other than this boxes of nearly 150 rupees is also used to store fish during transportations, the other important fact is that this box is thrown out after the trip. Then rice husk is also used for keeping the fish cool. Cryogenics have the capability to provide uniform cooling, zero maintenance and it is pollution free. So it can considerably reduce the wastage and dependence of ice if used effectively.

5. OBJECTIVE

5.1 Primary objective:

Project is mainly aimed to analyze the current transportation system of seafood/fish in the country. It covers:

- Problems faced
- Usage of refrigeration system
- Usage of ice and other preservative mechanisms
- Fuel consumption
- Condition of the vehicle
- Role of the driver
- Profit margins
- Other road Transportation issues

5.2 Secondary objective:

After studying the fish transportation system the scope of applying cryogenic cylinder in the current system is analyzed. It includes:

- Market opportunity of cryogenics
- Technical advantages
- Financial Benefits
- Awareness among the customers

6. LITERATURE REVIEW

This is a less researched area. So there are very few details regarding the cryogenic transportation issues. The literature review was mainly based on the IOCL experts.
Some of the key finding in the literature review which has helped us in the survey is:

- Diesel based refrigeration system consumes nearly 3 liters of diesel per hour.
- Diesel based refrigeration system doesn't provide uniform cooling
- Diesel based refrigeration system increases the maintenance cost of the vehicle as well as the down time of the vehicle increases.
- Diesel based refrigeration system causes a lot of environmental pollution.

These are the main negative aspects or the disadvantages of diesel based refrigeration system. So all these factors will be analyzed.

Then the next details are of the cryogenic cylinder whose market potential is to be analyzed.

- Two types of cylinders are available in the international market; they are of capacities 420 liters and 620 liters respectively. Their cost ranges from 8 lakh to 10.5 lakhs.
- The amount of nitrogen consumption by the system is 20 liters per hour for maintaining -18 degree in a 26 ton truck.
- The main constraint of the project is availability of nitrogen, but when there is feasibility of the project nitrogen will be made available according to their requirements.
- The cost of nitrogen will be around 15 per liter.

Based on these factors financial and technical feasibility of the project will be checked.

7. RESEARCH METHODOLOGY

The type of research used will be **analytical research**. This is because from the research a conclusion has to be obtained, so the best possible way to approach will be by analyzing and then concluding. So the conclusion will be whether cryogenic cylinders can be applied in fish transportation or not. Technical, financial, SWOT and market feasibility of the project will be analyzed.

7.1 Design of sampling plan

A sample design is a definite plan determined before any data are actually collected for obtaining a sample from a given population. Our plan is covering the following areas.

Vishakhapatnam

Vishakhapatnam is one the biggest hub of fish transportation to other parts of India and also to abroad. In terms of costal area and fish production it is second in India after Gujarat. Then the Vishakhapatnam port is also one of the main ports in the country from which fish is exported to different parts of the country, but our focus will be on the fish transportation via road from Vishakhapatnam to different parts of the country. So the main coastal area which we will be focusing is the R.K beach area. This is also the main harbor where fishing happens.

Other than this there are some more important locations from which fish transportation is done namely Bhimavaram, Gajuvaka, Narayananpuram, Unguturu. All the areas other than gajuwaka is famous for aquaculture.So, We are using **Area sampling** as total geographical area of interest happens to be big one because distance between these places is about 300km. Under area sampling we first divided the total area into a number of smaller non-overlapping areas i.e

R.K Beach fishing harbor, Gajuvaka Industrial Area, is the first areas of interest since they are in Vishakhapatnam around 30 kilometer distance. Then we moved to Bhimavaram, Narayanpuram, Unguturu which is 300 kilometers away from Vishakhapatnam, and all units in these areas are included in the sample. This analysis is like it covers almost all the fish transport in the country. The different types of sea fish, cultured fish, prawns, shrimps everything is covered in this report.

Area sampling was very helpful to us since we do not have the list of the population concerned in those areas. It made the field interviewing more efficient since we could do many interviews at each location.

Along with area sampling we opted snowball sampling in these divided geographical areas which helped us to gather information of our next sample and next sample led us to another sample. We selected snowball sampling typically because we were unable to find the required samples details from internet and other sources. The other thing to be noted is that the fish business is something which is unofficial there is no much government details regarding the quantity of fish sold and the transportation details is not much available.

7.2. Design of experiment

Our first target was the RK beach. From there we came to know where all the fish is sold. We came to know regarding the major buyers and transporters in the area. They told us about Fishing Harbor where all the major trade of fish is taking place. From there we were able to locate our samples. In our primary inspection

we could identify that from that location we can easily gather around 20 of our required sample. We started our survey on June 3rd but due to the fishing holiday for nearly 45 days (April 15 to May 31st) more than 80% of the shops remain closed. We interacted with various government agencies like MPDEA and Fishing survey department to know how the fish business is done from its catching, processing and transportation to end consumers of other parts in the country. So we did our survey for nearly 20 days in Vishakhapatnam and gajuwaka areas. Gajuwaka is an industrial area where there are a lot of transporters. So survey was conducted accordingly since they are almost at a distance of nearly 30 kilometers from each other. From these areas we also came to know about the different transporters in the nearby area. As referred earlier we followed snowball sampling approach. The time duration for this data collection was nearly 20 days as mentioned, the reason for this much days is due to the fishing holiday from April 15th to May 31st.

Then we moved on to the second stage of our survey. This was done in bhimavaram, narayanavaram and ungunturu areas. These areas are famous for aquaculture. Bhimavaram is the leading area in the world in terms of aquaculture. It is the aquaculture heart of Andhra Pradesh. The main focus was on the bhimavaram area and we collected nearly 25 samples from this area. We will also have a small study on aquaculture from this area. The feasibility check will be based on these samples.

The last stage was again in Vishakhapatnam. It will be just a concluding part for 2 or 3 days to gather the information from the last few shops left out.

Total of 60 companies were analyzed and 112 samples was collected.
Vishakhapatnam and gajuwaka - 25
Bhimavaram - 25
Narayanavarm and ungunturu - 10

7.3. Design of questionnaire

Questionnaire is considered as the heart of a survey operation. Hence it was very carefully constructed. If it is not properly set up, then the survey is bound to fail. This fact required us to design a good questionnaire. The main aspects of a questionnaire were general form, question sequence and question formulation and wording.

1. General form:

General form of a questionnaire is concerned with the structure of questions, it can either be structured or unstructured questionnaire. We used structured questionnaires (those questionnaires in which there are definite, concrete and pre-determined questions). The questions were presented with exactly the same wording and in the same order to all respondents. This was done to achieve standardization and to ensure that all respondents reply to the same set of questions.

For example: Which places you transport your fishes? Or, How fish is kept cool in your truck? etc
The form of the question used was
Either closed (i.e., of the type 'yes' or 'no') with comments or open (i.e., inviting free response) questions with and without options were used.

2. Question sequence: In order to make the questionnaire effective and to ensure quality to the

Replies received, we paid attention to the question-sequence in preparing the Questionnaire. A proper sequence of questions reduces considerably the chances of individual questions being misunderstood; we kept this in mind while designing the questionnaire. The question-sequence was designed in a clear and smoothly-moving, meaning thereby that the relation of one question to another should be readily apparent to the respondent, with questions that are easiest to answer being put in the beginning. The question-sequence was from general questions to specific questions. A funnel pattern approach was followed.

First few questions were regarding the present system which is being used in the transportation of fishes and to get their response on the satisfaction level with the present system. After this questions regarding the problems which are being generally faced in the present system was asked. These problems gave us opportunity to introduce our cryogenic product in further questions and their expectation from new product was asked at last.

3. Question formulation and wording: With regard to our questionnaire, all questions were very clear for any sort of misunderstanding can do irreparable harm to a survey. Question was also impartial in order not to give a biased picture of present transportation of the fish. Questions were constructed with a view to their forming a logical part of a well thought out tabulation plan , for example questions were different for those using ice and for those using diesel refrigeration system.

Questionnaire was short and simple i.e., the size of the questionnaire was kept to the minimum. Questions were preceded in logical sequence moving from easy to more difficult questions. Personal and intimate questions should be left to the end. Technical terms (example-Cryogenics, technology) will be difficult for fish traders and drivers to understand so such wording and interpretations were avoided in a questionnaire. Some control questions were also asked like consumption of diesel or weight of fish transported were asked , thus, introduce a cross-check to see whether the information collected is correct or not.

7.3.1. Questionnaire

1) Is refrigeration system used in the transport trucks?
i) Yes ii) no

2) Percentage of fish wasted when it reaches the delivery point?
i) Less than 5% ii) 5-10 % iii) 10-15% iv) 15-20%

3) Are you satisfied with the current freezer you are using?
i) Highly satisfied ii)Satisfied iii)Neutral iv)Dissatisfied
v) Highly dissatisfied

4) How much distance are you covering till your delivery?

i) Below 500 kms ii)500 –1000 kms iii)1000-1500 kms
iv)500-2000 kms v)Above 2000 kms

5) What is the time taken for your complete delivery?
i) Less than 1 ii)1-2 days iii)2-3 days
iv) Above 3 days

6) What is the capacity of the container?

7) Quantity of fish transported?

8) Quantity of ice used for preservation?

9) Price of ice?

10) Location to which the fish is transported?

11) Mileage of the vehicle?

12) What kind of truck you are using?
i) Open truck ii) insulated truck iii) refrigerated truck iv)others

13) Transportation cost?

14) Total diesel consumption by the vehicle?

15) What is loaded in the truck in the return trip?

16) Earnigs per trip?

17) Maintenance cost per year?

These were the common questions to all. Then the following are the questions which were asked for those who use refrigeration system.

18) Cost of the refrigeration system?

19) Cost of precooling?

20) Temperature at which fish is stored?

21) Main problem associated with refrigeration system?

22) Diesel consumption by refrigeration system?

23) Maintenance cost of refrigeration system?

24) Down time of the vehicle?

Next type of questions were common to all and it was mainly to give them an experience of what the product is and a way of indirect marketing that could be done.

25) When you are buying a new product which is the feature you are most interested in? (Rank it: 1 to 5, first preferred given 1 and the least 5)

26) Are you aware of nitrogen based refrigeration?
i) highly aware ii) aware iii) neutral iv) unaware v) highly unaware

27) Are you aware that nitrogen based refrigeration is 100% environmental friendly?
i) highly aware ii) aware iii) neutral iv) unaware v) highly unaware

28) Are you aware of the high environmental pollution caused by diesel engines?
i) highly aware ii) aware iii) neutral iv) unaware v) highly unaware

29) Nitrogen based refrigeration is environmental friendly, uniform cooling and cost effective. Would you opt to shift towards nitrogen based refrigeration at a higher cost if it gives 20-30% increase in profit?"
i) Definitely yes ii) possibly yes iii) neutral iv) possibly no v) definitely no

Next few questions were based on the return on investment and the extra transportation cost that people were ready to pay:

30) How much money you would be ready to spend on this new product which gives you an increase in profit of 20-30%?

31) How much more money you are ready to spend on transportation if ice could be avoided?

32) Expected return on investment?

7.4. Determination of sample size

This refers to the number people to be selected from the Visakhapatnam and other areas to
Constitute a sample. Our sample size is 60 because the size of sample should
Neither be excessively large, nor too small. It should be optimum, as sample size should be the one which fulfills the requirements of efficiency, representativeness, reliability and flexibility.
The size of population was also kept in view for this. While deciding the size of the sample, the following factors were also connsidered:

1. Research specific population: Keeping in mind the number of transporters in Vizag,Bheemavaram,Narayananpuram and Ungturu, we felt that sample size of 60 would be optimum considering the specific population which are of our interest.

2. Cost considerations: From practical point of view, the cost was a major factor to decide the sample. The locations are nearly 300 kilometers apart and the samples are also widely spread. So to reach the samples the transportation cost is very high. Even the stay at different locations were also considered.

3. Time consideration: As we were having around 35 days to conduct our research,we kept our sample size of 60 for the reliable results. Setting up target bigger than this would have certainly decreased our efficiency as we would have to interview people in less time resulting in poor data collection. Then the monsoon season here was also playing a major role by limiting our efforts.

7.5. Design of sampling frame

We have divided our samples of the people associated with fish transportation. It was mainly divided into 3.

1. BUYER: This sample buys fish from fishermen and transport it various parts of India by giving rents to the transport company. So we analyzed mainly the rent paid by them and the way in which they transported fish. There problems were analyzed.

2. TRANSPORTER-This sample is not involved in any monetary transaction related fish selling and buying. He is only transporting fish of buyers and taking money for the use of his trucks. Transporters are further classified on basis of type of truck container
-Open Truck
-Closed or Insulated Truck
-Refrigerated Truck

3. BUYER AND TRANSPORTER-This sample buys fish and transport them to end points through his own truck. If demand is high, he also sometimes contacts other transporters due to non-availability of his own trucks.

8. Execution of survey

Primary data was collected through survey. The samples consisted of to the various dealers, buyers, fish farmers, transporters, drivers for collecting appropriate information

In our survey, data was collected in the following ways:

(i) By observation: This method implies the collection of information by way of investigator's own observation, without interviewing the respondents. We observed various things related to fish transport related to fish transportation ,for example, how the fish is loaded on the truck, use of thermocol ,use of ice, precooling before transportation

(ii) Through personal interview: We interviewed the traders, buyers, transporter and drivers personally to gather information. Firstly, we called them and asked for the suitable time when they can meet. We positively went to their offices for personal interaction. This approach was followed because with some individuals questionnaire approach was not effective.

(iii) Through schedules: We prepared questionnaire containing relevant questions. We went to the respondents and interacted with them according to the questionnaire. Data was collected and we ourselves filled up the questionnaire. This method was mostly used by us. In certain situations, schedules were handed over to respondents and we helped them in recording their answers to various questions in the said schedules. We explained the aims and objectives of the investigation and also remove the difficulties which any respondent may feel in understanding the implications cryogenics in transportation as this was very new to them.

(iv) Through telephone interviews: There were some transporters who were out of city. So, we called and gathered the required information. This method was very less.

9. ANALYSIS

The analysis will be mainly regarding the current technology used for transportation of fish. Based on this analysis the technical and financial aspects of the project will be interpreted. The factors analyzed are completely based on the questionnaire used.

9.1. USAGE OF REFRIGERATION SYSTEM

Based on secondary data the major information was that the fish transportation in india is mainly done in refrigerated trucks. The major hub from which fish is transported is considered to be Vishakhapatnam. But when survey was conducted it was found that majority of the trucks are not using refrigerated systems. They are transporting the fish in open and insulated trucks. Refrigeration systems are used mainly when the fish is transported to foreign countries in ship.

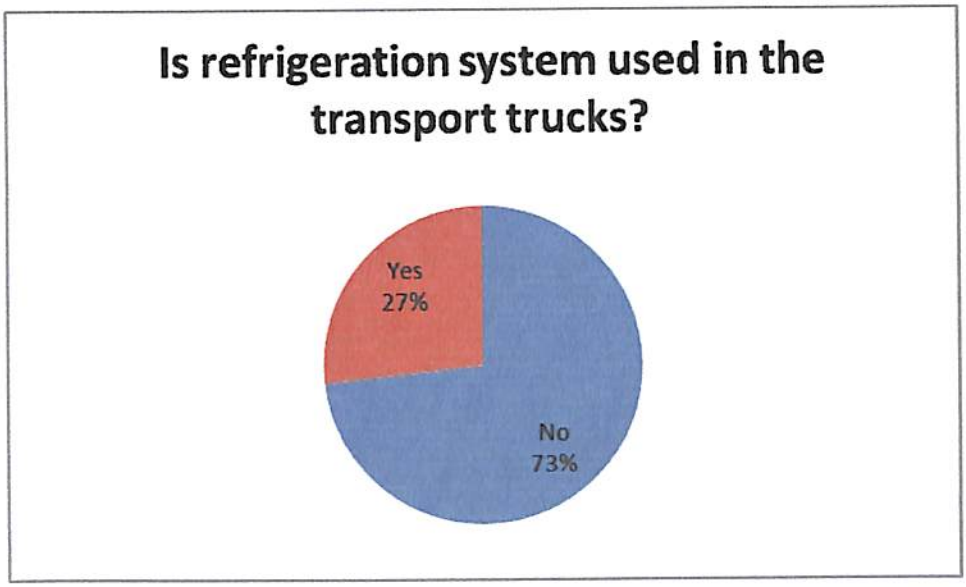


Chart 1:Refrigeration system used

This means that in fishing sector the road transportation is not mainly dependent on refrigeration.Based on the data we can see that only 27% is using refrigerated system and the majority that is 73% is not using refrigeration system. So we can say that our secondary data assumption is wrong. So our project objective is to be shifted from refrigerated system to trucks without refrigeration. This is because the major scope lies in the trucks without refrigeration. So instead of replacing the refrigeration system we could actually try to replace ice. From the primary inspection it was very much evident that the dependence of ice is very high. For transporting 4 tons of fish nearly equal quantity and in some times more than that is used. So with cryogenics we could actually try to replace ice with nitrogen refrigeration.

9.2. HOW FISH IS KEPT COLD DURING TRANSPORTATION?

Fish is mainly caught from sea or fish ponds. In case of catching fish from sea fishing boats will be in sea for about a month or some times more than that. The fish is preserved in ice and kept and closed containers. Small boats assist the big shipping boat in bringing ice and other materials. The main shipping boat will be permanently in sea and the fish caught is transported to harbors with the help of small boats. Then that fish auctioned and it is purchased by different dealers. Sometimes there are permanent fishing boats for certain

dealers which on contract bring the required quantity of fish at regular intervals. Then other than fish prawns are also exported in large quantities. The major types of prawns are.

1. Brown
2. White
3. Flower
4. Tiger

The price at which fish and prawm is purchased by the dealers depends on a lot of factors. Major factors are:

- Good catch of Fish- If there is a good catch that means the quantity of fish caught from the sea is really high then then the price will be low. Large availability will result in lower prices. So at this time the dealers tend to buy fish and try to store it.
- High demand for particular – Sometimes there will be great demand for particular type of fish at this point there will be great competition among dealers. So at this point the price of fish will be very high.
- Bad quality of fish- Fish is transported from deep sea to harbor in small boats. It takes days. So there is a high chance of fish getting damaged, if the quantity of fish damaged is high in the lot then fish will be sold at lower price.

Then we have fish grown by **aquaculture.** That is fish is grown in ponds. At first fingerlinks that is the first stage of fish. They are bought and grown in ponds or syntax tanks for a period of three months. During this period the main food for the fish is groundnut cake. Due to the modern technological advancements much scientific method are also used to enhance the growth of fish. But mainly ground nut cake is given. Then when they achieve the required growth they are shifted to the next pond for a period of 6 months. During this period fats, carbohydrates, protein enriched food is given to the fish. Mainly rice husk and other highly enriched fish food is given in this stage. Main types of common fish food given in this stage are groundnut cake, cotton cake, sau seed cake etc. Then after this period it's the harvesting period. For that the fish is again shifted to another tank, which is the main tank. This period can last from 1-1.5 years. This is how fish is cultivated.

After fish is bought by the dealer it is processed. The fish processing is of two types' chilled fish and frozen fish.

Chilled Fish- Chilled fish means the fish is maintained at a temperature around 2-5 degree Celsius. Chilled fish is used mainly for road transportation. Ice packing is done to achieve this temperature. Fish is kept in crates or thermocol boxes and ice layering is done. Fish and ice is kept in 1:1 ratio. The bottom layer is ice then on top of that fish then again ice then again fish and the topmost layer again ice. One box can store 50-55 kg. It contains 25-30 kg fish and remaining ice.

Plastic Crates- They are mainly used for short distance transportation. That is they are preferred for trips of less than 3 days. They don't have the the ability to hold the temperature for longer period of time. But they can be used again and again. They are very much durable.

Thermocol Boxes- They are very costly. On an average thermocol boxes costs rupees 130. But they have the ability to preserve the temperature for longer period of time. So they are used for long distance transportation. But they are not reusable. After one trip they are thrown away.

Packing of boxes –The crates or thermocol boxes are kept one over the other. They are generally kept airtight. Nearly 200 to 260 boxes can be kept in a truck. In an open truck on the bottom a layer a thermocol is placed and over that the boxes are kept and ice is put on top of it and covered with a tick plastic cover. Then over the top of plastic cover nearly 1-2 tonnes of risk husk is put. Then on top of it again thick plastic cover is put. Whereas in the case of insulated and open trucks just airtight packing is done.

A Picture of a thermocol box

Fig 8: Thermocol box and Plastic boxes

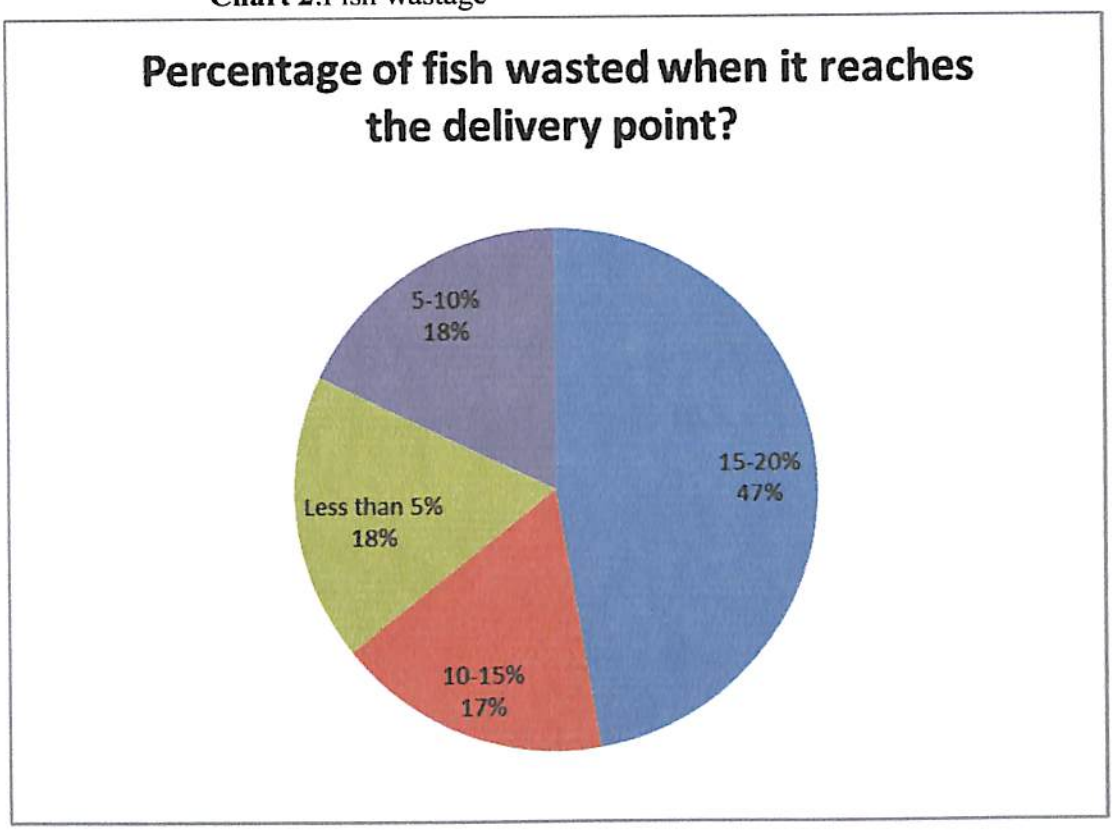
Frozen Fish- Frozen fish when the fish is frozen and is kept at a temperature of -18 degree Celsius(it's the standard temperature). Different types of freezing such as bulk freezing, Block freezing, IQF freezing, vacuum freezing etc is done. Among these vacuum freezing is the costliest of all. Even nitrogen based freezing was also done. But now it is not in use since it was too costly. The cost of freezing 1kg of fish using nitrogen was around 45-50 rupees. So due to this very high cost it was stopped. Now commonly bulk and block packing is used. The average cost is around 15-20 rupees. Then before freezing they are also subjected to chemical treatments. Sometimes according to customer demands special type of cleaning and treatment processes are done. But special care is always done to preserve the food. Mainly ammonia freezers are used for transportation in ships. They can give effective cooling and very much cost effective. It takes sometimes 20 to 60 days for transportation via ship, and the cases of damage are very rare. As explained earlier R.K beach in Vishakhapatnam is the main hub for exporting fish and prawns in containers. From R.K we have

the major catch of sea fish and prawn. Whereas bhimavaram and narayanavaram are the major areas of aquaculture. Bhimavaram is country's biggest location of aquaculture.

9.3. DAMAGE OF FISH

This is the main problem which is being faced by the transport sector the since it takes more than two or three days to transport fish large quantities gets destroyed. This is the survey data collected. Out of the 112 samples 47% of samples have a loss of 15-20%. This is the loss on an average basis. That is it can be considered as the minimum loss that occur. In some other conditions such as repair of vehicle, strikes, and long waiting hours in check posts etc the losses are even higher. Then the damaged fish in the lot will be only 15-20%, but their effective oss will be even higher. Since one-fifth of damaged fish is visible it will result in lower price of the whole lot, and moreover than the damaged quantity is thrown out which results in a straight wastage.

Chart 2:Fish wastage



The profit margins from the fish vary time to time. It is purely dependent on the market conditions. For example if some a desired quantity of Tuna (a particular variety of fish) is transported from Vishakhapatnam to Kolkata the price purely depends on the availability of Tuna in Kolkata. If tuna is not available then the price will be high, but if it is highly available to satisfy the demand the price will be low. But from our survey analysis on an average they earn nearly 2 rupees on 1 kilogram. So based on this their loss due to damaged fish can be easily found out. This is a small analysis of the average loss incurred per trip due to the fish damaged. This data is only based on the transportation cost. The processing cost is constant and the purchase cost of raw fish from the harbor varies as explained earlier.

Fish Transported from Vishakhapatnam to cochin

Table 5: Transport Details(Vizag to cochin)

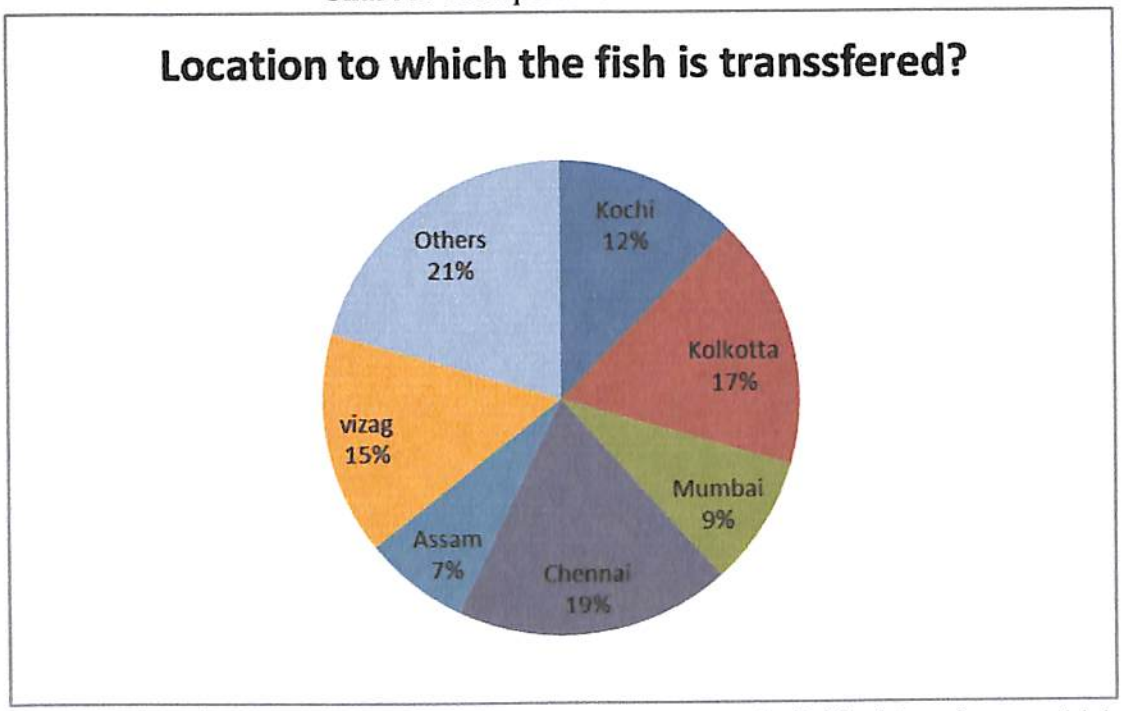
Quantity Transported	5 tone
Expected profit	Rs.2 per kg
Total profit(without damage)	Rs.10,000
Damaged fish(in percentage)	20%
Damaged fish (in tonne)	1 tonne
Loss due to damage	Rs.2000
Total profit after loss	Rs.8000

This is the loss during each trip and that also in standard conditions. For prawns the profit margins are very high and as a result it will have huge loss due to damage. Prawns are also to be handled very carefully because if a small quantity of prawn gets damaged it can sometimes affect the whole lot.

9.4. MAJOR LOCATIONS TO WHICH FISH IS TRANSPORTED

This data is entirely based on the survey details. The main objective of this particular analysis is to find out the major locations to which fish is transported from Vishakhapatnam. So based on this data we could find out on which all locations we could install the nitrogen refilling stations. Then based on that data the project could be started on those particular locations.

Chart 3: Transportation locations



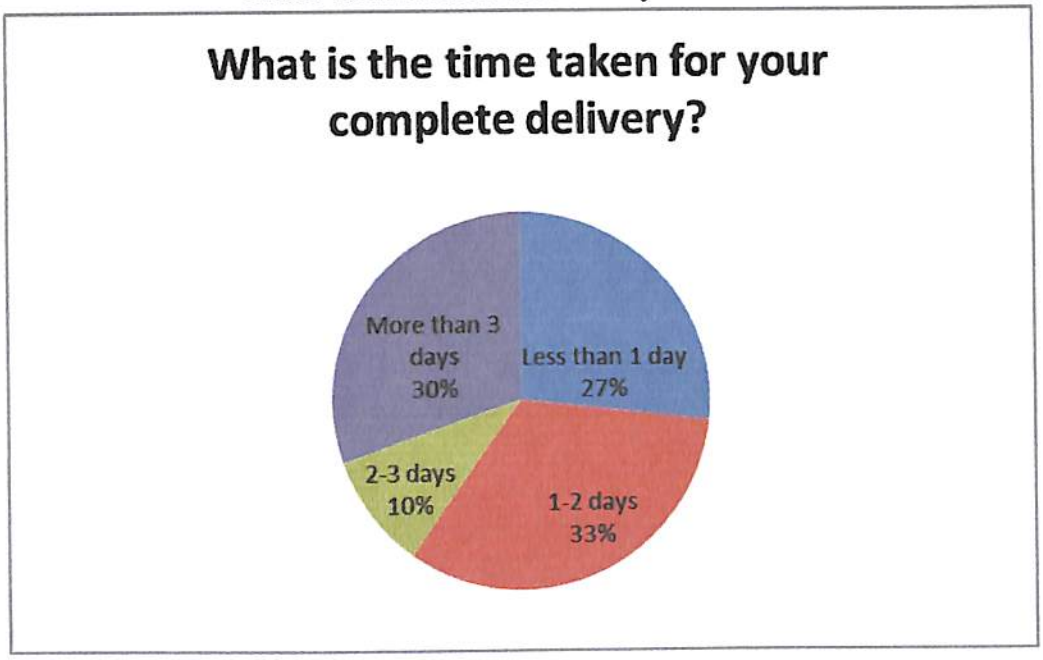
Based on the analysis it was found out that Kolkata is the individual location to which fish is transported in roadways. So this route could be considered as potential area if the project is implemented. Next is Chennai. But Chennai is mainly the port from which fish is exported. So it can't be actually considered as a potential route. Even Vishakhapatnam is also the location for the port. It is based on the survey data from bhimavaram. Then the other major locations to which fish is transported from roadways is cochin and Mumbai. They are also among the major consumers of fish in the country. But fish is not transported in

large quantities as compared to kolkota because of the distance. Both Cochin and Mumbai are at a distance more than 1600 kilometers from Vishakhapatnam. Then the longest location to which fish is transported is to assam mainly in Guwahati. Then it is also transported to howrah, nagaland, bihar, banglore, Jhansi, Tripura, allahabad, agarthala. Etc. But still fish is been transported to these locations at regular intervals. So based on the particular route in the initial stage different locations are to be found out for the nitrogen station installations. The interesting thing about Kolkata is that being major fishing hub still a lot a fish is being transported to Kolkata. This is because they are among one of the top consumers of fish in the country. Then moreover that a lot of fish is being exported from Kolkata to different parts of the world. So it's a potential buyer of fish from vishkapatanam. Moreover Kolkata is also at a close proximity to Vishakhapatnam.

9.5. TIME TAKEN FOR DELIVERY

According to the available secondary data the two types of cylinders available are which can last for 18 hours and 26 hours respectively. But other than this different cylinders according to the customer needs could be easily constructed by the IOCL. Then since refilling stations are also planned to be installed at different locations

Chart 4:Time taken for delivery



From the data we can see that nearly 33% of the trucks are taking 1-2 days for their delivery. So this could be a good opportunity, since it just requires one or maximum two refilling during a trip. Then there are also a lot trucks, to be exact nearly 27% are taking less than 1 day for deliver. This is mainly is Kolkata and Chennai. So here in this case with cryogenic installation we could sometimes run the truck without any refilling. But the main concern or the dark area is the thirty percent of trucks which take more than three days for their delivery. We could find that some trucks even take six days for their delivery. So in this case installing cryogenics won't be that much economical. But still the prospect lies in the 60% of the sample which takes less than 2 days for their journey. Then the mainly these trucks travel at night in the cities. This is mainly to avoid traffic blocks. So during day time the truck will not be running. But nitrogen cylinder has be running is installed.

TRANSPORT TIME IN HOURS

Table 6: Transport Time in Hours

LOCATION	TIME(IN HOURS)
KOLKOTA	22
MUMBAI	38
COCHIN	36
CHENNAI	20
GUWAHATI	72

This is the table which explains the travel time of trucks to different locations.

9.6. QUANTITY OF ICE USED

As explained earlier ice is used in 1:1 ratio and sometimes more than that. Usually on an average 4 to 5 tons of ice is used for transporting 5 tons of fish or prawn. The cost of ice ranges from rupees 1200 to 1500.Ice can keep the fish chilled up to four days if properly packed. Then when kept in a thermocol box the quantity of ice is used is low. For 5 tons of fish it just require 3-3.5 tons of ice. But when it comes to plastic crates it the quantity of ice required is very high that is for 4 tons of fish it requires more than 4 tons of ice. This is because a plastic crates don't have that much ability to preserve the temperature as compared to thermocol boxes. Ice is usually broken into small pieces and mixed with fish. It is kept in layers.

Whereas for frozen fish ice is not used. It is frozen and then the temperature is maintained by refrigerating system. Different types of freezing methods are used as explained earlier. In frozen fish the quantity of ice will be very low. It is like for 8 tone fish there will be maximum 2 tone of ice. In frozen fish refrigerating system is used to maintain the temperature. In temperature at which fish is frozen ranges from -20 degree to -40 degree. Then in open trucks with ice rice husk is also used for preserving the temperature.

9.7. CAPACITY OF THE CONTAINER

The size of container varies accordingly. For open truck the size ranges from 8 ton to 16 ton. For a standard insulated truck the capacity is 8-10 ton. It can also range upto 16 ton. Whereas fo containers used n ships there are two types they are

1. 20 footer- It has a capacity to store 11 tons
2. 40 footer- It has a capacity to store 28 tons

But these containers have nothing to do with road transportation. They are not economical. They are used in ships and in very rare cases in road transportation.

9.8. TYPE OF TRUCK USED

Mainly there are three verities of trucks used by the transport sector. They are as follows

1. Open truck – They are the ordinary trucks or Lorries which are used for multiple purposes. There carrying capacity range from 6 ton to 16 ton. They are the cheapest among the lot. This is because there are not specially designed for any particular purposes. They have multiple uses. But for transporting fish in such type of trucks require extra care. The base layer is made with thermocol and ice is placeed in between. Then over top thick it is covered with thick plastic cover. Then over that again rice husk is put over it.
2. Insulated truck – This the ideal and cost effective means of transport for the truck. It is actually an insulated container fitted in an ordinary truck. It is of 3.5 lakhs- 5 lakh cost. It is specially designed for transporting fish. It can maintain the temperature for a longer period of time. It doesn't require any particular maintenance. But due to this added cost it is not that much in use as compared to open truck.
3. Refrigerated truck – This is actually used for transporting truck to foreign countries. This container is fitted in the truck with is attached with a refrigerating unit, that same container with the refrigerating used is placed in the ship. So these types of trucks are used for transportation from processing plant to the port.

This is the survey details regarding which type of truck are used for transportation of fish from Vishakhapatnam to different places in country.

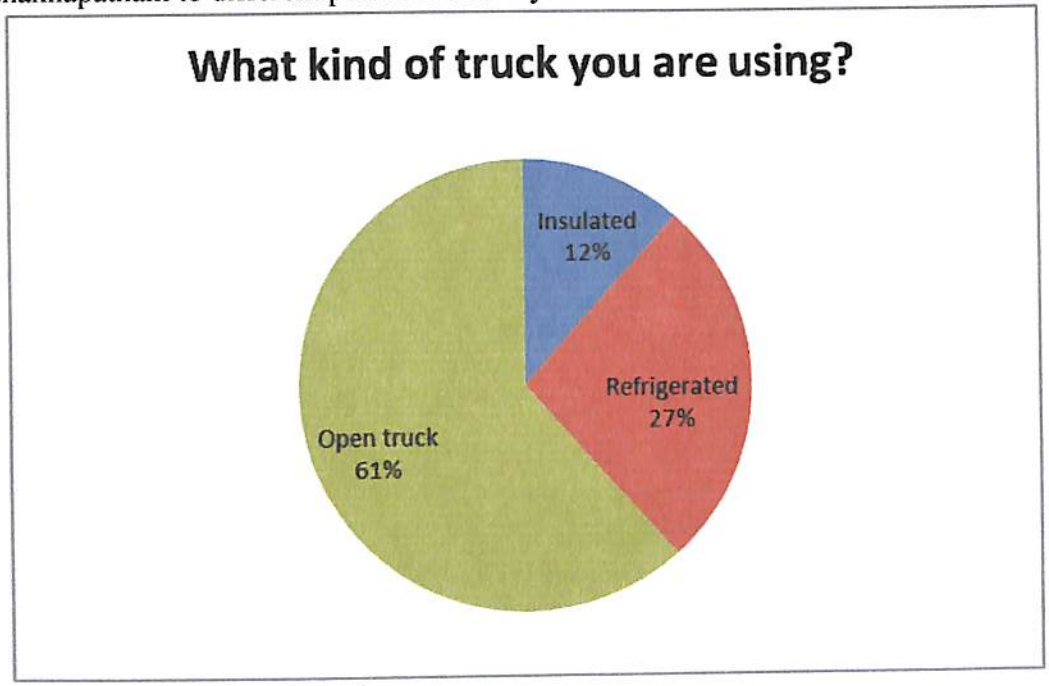


Chart 5:Type of truck used

We can see that 61% is using open truck followed by 27% using refrigerated trucks. But this is to be noted that this 27% is the containers which are to be transported by ship. So they are just travelling till the port. The least with 12% is the insulated trucks. But the thing to be noted is that this 12% is the area where there is potential for cryogenics. A refrigerating unit could be installed in the insulated truck. This can reduce the dependence of ice to a large extent. But the main area that is in the refrigerated trucks it could not be used.

This is because while transporting in ship it takes more than 20 days. So it won't be feasible to use cryogenics. But the negative area lies in 61% of open trucks which are used. It will be very difficult to implement cryogenics in that area. This can even be said as a negative area in our project. The major transportation is done with open trucks so it put great doubts in the feasibility of the project.

9.9. TOTAL DEISEL CONSUMPTION OF THE VEHICLE

Based on the secondary data diesel consumption was a great issue. If a refrigerating unit is there in the truck it will definitely reduce the performance of the vehicle and increase the diesel consumption. But as we can see from the survey refrigerating system is used only till the port rest all the trucks are running without any refrigerating unit. This diesel consumption analysis is used to find out just the transportation cost.

This is a table which shows the diesel consumption of a vehicle (one way) to some of the major locations in the country from Vishakhapatnam.

DIESEL CONSUMPTION OF OPEN TRUCK(One Side)

Table 7: Diesel consumption of open Trucks

Kolkota	200 liters
Cochin	300liters
Mumbai	300 liters
Chennai	175 liters
Guwahati	600 liters

This data is mainly concerned with open trucks having a mileage of 5-6 kilometers. But in the case of refrigerated trucks it is double of this. They are having a consumption which is double of this. They are only having a mileage of 2-3 kilometers. Then the other thing to be noted is diesel consumption by the refrigerating system. As explained earlier this is details till the port.
It ranges from 10 liters to 35 liters for a trip 650 kilometer trip. So the diesel consumption of the vehicle is very much less than details collected from the secondary data. This shows that the feasibility of project is very low in this particular area.

Table 8: Diesel consumption of refrigerating system of some trucks which are travelling to Chennai.

COMPANY	DISTANCE	TIME	DISEL CONSUMPTION	CONSUMPTION PER HOUR(liters per hour)
ANANDA AQUA EXPORTS Pvt.Ltd.	659 kms	20 hours	10 litres	.5
SURYAMITRA EXIM PVT.LTD.	550 kms	12 hours	22 litres	1.833
JAGADEESH MARINE EXPORTS	600 kms	20 hours	35 litres	1.75
RVR Marine Products LTD	650 kms	20 hours	50 litres	2.5

From this analysis it's clear that the diesel consumption is maximum of 2.5 liters per that means on an average. That means when we are calculating at a price of 60 per liter it will be rs.150 maximum.

2.5 liter diesel (price=rs.60), total cost = rs.150

20 liter nitrogen (minimum),price rs.15/liter =rs.300

This means that the refrigerated truck owners will have to pay double the amount for using nitrogen based refrigeration system. This is too expensive if we look into any perspective. From the data collection we also came to know that the maintenance for refrigerated system is very low. In one of the companies we surveyed they told that they hasn't had any repair works for the past two years. Then the other question regarding the maintenance of the vehicle its like they are only having the regular maintenance works. No extra maintenance they are having due to the presence of refrigeration system.

Satisfaction level of the customers

This was question to check the current satisfaction level of the customers. It was very much surprising that everyone is satisfied with their current technology. This shows that introduction of a new product in the market will be a difficult task. That means the technology will have to offer something really extra ordinary in order to make the product acceptable. As we can see in the survey 71% are satisfied and 29% are highly satisfied with their current technologies.

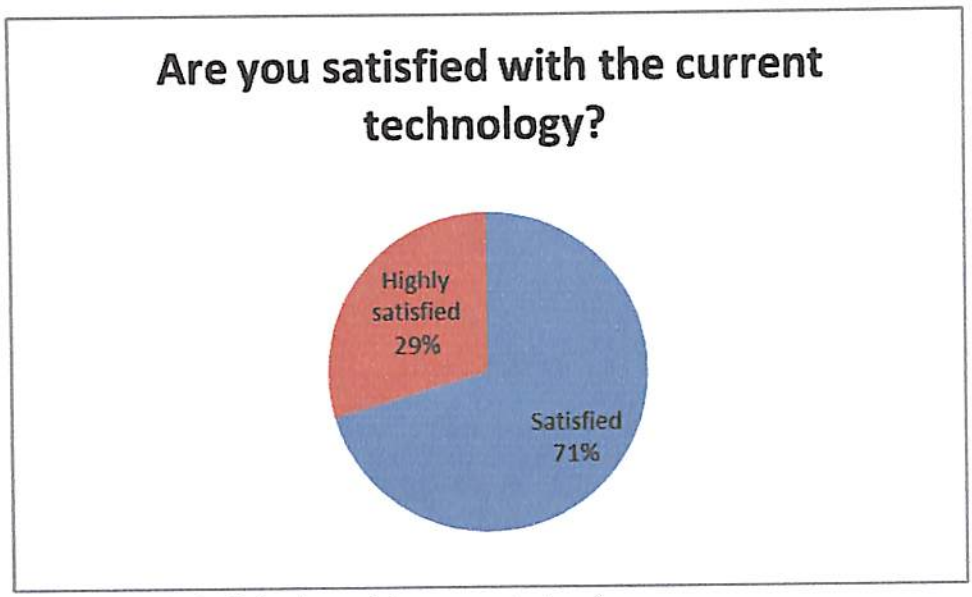


Chart 6: Satisfaction with current technology

The people who are highly satisfied are those who use refrigeration system. They are very much satisfied with the system they are using. But still the scope of cryogenic based refrigeration is very high. This is because it can replace the large quantity of ice. This can be an area which could be exploited. But since the existing system is giving good satisfaction level this could give good level of competition to cryogenics.

9.10. PRODUCT BUYING BEHAVIOUR

When a new product is being launched in the market most important thing that is to be checked is the buying behavior of the target population. Otherwise the key factor on which focus is to be put upon won't be understood.

The buying behavior were focused mainly on the five factors, they are:

i. price
ii. quality
iii. service
iv. maintenance
v. brand

So in the survey the question was to rate these parameters according to the interest of the target population. Since the product is having a high cost this factor was keenly observed. It is also to be noted that whether the customers are focused more on quality or price. Then since IOCL being a premium brand the attitude of the people towards the brand was also checked.

As expected more than eighty samples were concerned about the price. Then only they preferred quality. In the entire survey the brand was preferred last by the samples. So since it being a new product a clear idea was obtained that there is not much need in focusing on the brand name of IOCL.

When you are buying a new product which is the feature you are most interested in? (Rank it: 1 to 5, first preferred given 1 and the least 5)

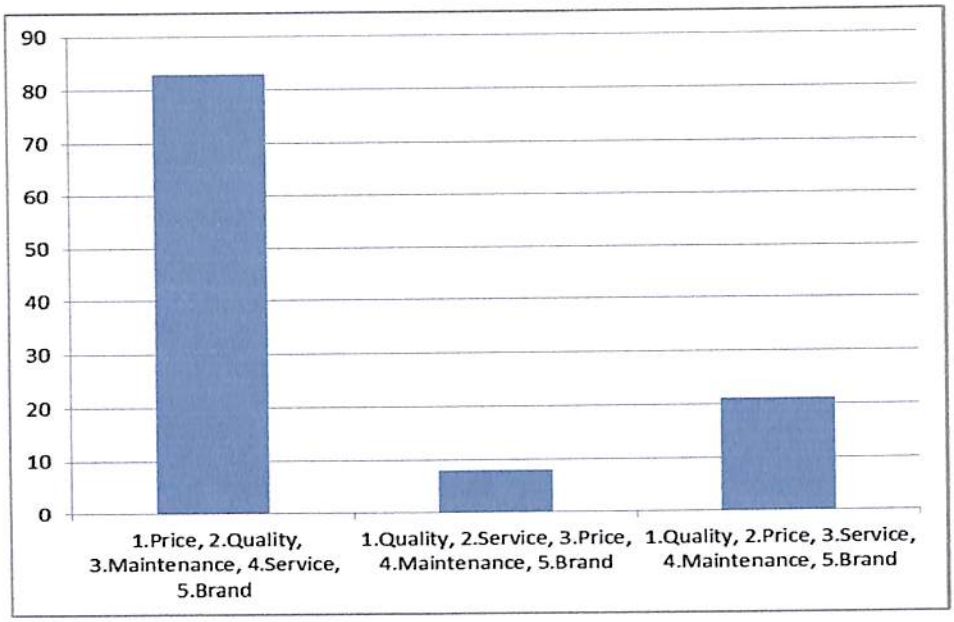


Chart 7: Features of a product

From the survey conclusion was obtained that the price of the product is to be checked. Many are concerned on the price. So it will be a very good option if the price of the product could be reduced to a large extend. Otherwise due to the high concern of price for the customers the product will be very difficult to sell. Then quality won't be an issue for cryogenics since it is best compared to its competitors.

9.11. RETURN TRIP

To calculate the cost elements the most important thing is regarding the return trip of the truck.
So the cost or the profit earned depends on what is bought in the return trip. For all the trucks the materials bought in return trip varies.

- Refrigerated truck – as explained earlier in the case of a refrigerated truck it carries the container which is to be transported into the ship. The return trip of the truck will be empty. The truck will be offloading the container in the port and then it will be returning. The container after delivering in the desired country will be loading something in the container. But it has nothing to do with the profit ratios.

- Insulated truck – mainly in an insulted truck plastic crates are transported. This is because if the fish is to be transported in thermocol boxes the cost will be very high. Moreover that the insulted truck can maintain the temperature to a very large extend. So mainly in the return trip the truck will be coming empty with the plastic crates in the truck. So for calculating the transportation cost of insulated truck will be calculated on the expense of the two way journey. In some rare cases these types of trucks bring something in their return journey.

- Open truck – In an open truck usually they bring something in their return trip. The transportation cost of open truck is usually calculated in terms of the cost of one way trip that is till the delivery point. So usually for an open truck the transportation cost is very low. The things which are bought in the return journey are:

Kolkata - usually from here they bring fish food in the return journey. Even furniture is bought in return journey. But it depends on the availability and the order which is put up by any of the farmer. Usually the trip is planned accordingly. Sometimes according to the driver some goods are bought back.

Mumbai- from Mumbai main textile related materials are bought back. But as explained this will be bought according to pre order and also availability.

Assam and other eastern states- from these places a variety of goods are loaded back in the truck. Usually bamboo stick is the major material which is bought. The other materials are carbon coke and plywood. Since it is long trip the trip is always charted in such a way that goods are loaded back in the return trip.

Chennai – from Chennai mainly vegetables are bought. They are bought on regular basis.

9.12. MILEAGE OF THE VEHICLE

The mileage of the vehicle is a very important factor for evaluating the performance of the truck. The mileages of the three types of trucks which are used are as follows:

- Open truck: 5-6 kms
- Insulated truck: 4-5 kms
- Refrigerated truck: 2-3 kms

As we can see the refrigerated trucks are getting the least mileage; the reason being due to the large load which is being transported. Followed by the insulated truck and the open truck which gives the maximum mileage among the lot. Due to this the transportation charges for refrigerated truck is very high.

9.13. TRANPORTATION COST

Table 9:Transportation cost for an insulated truck(one side)

LOCATION	DIESEL(L)	FUEL COST(Rs.)	OTHER COST (Rs)	TOTAL(Rs.)
Kolkota	200	11000	7000	18000
Chennai	200	11000	7000	18000
Mumbai	420	23100	12000	35100
Cochin	400	22000	10000	32000

Other cost: it includes Bata to the driver, toll gate charges

- Cost of diesel taken is rupees 55 per liter
- Average mileage of the vehicle is taken as 4-5 kilometers

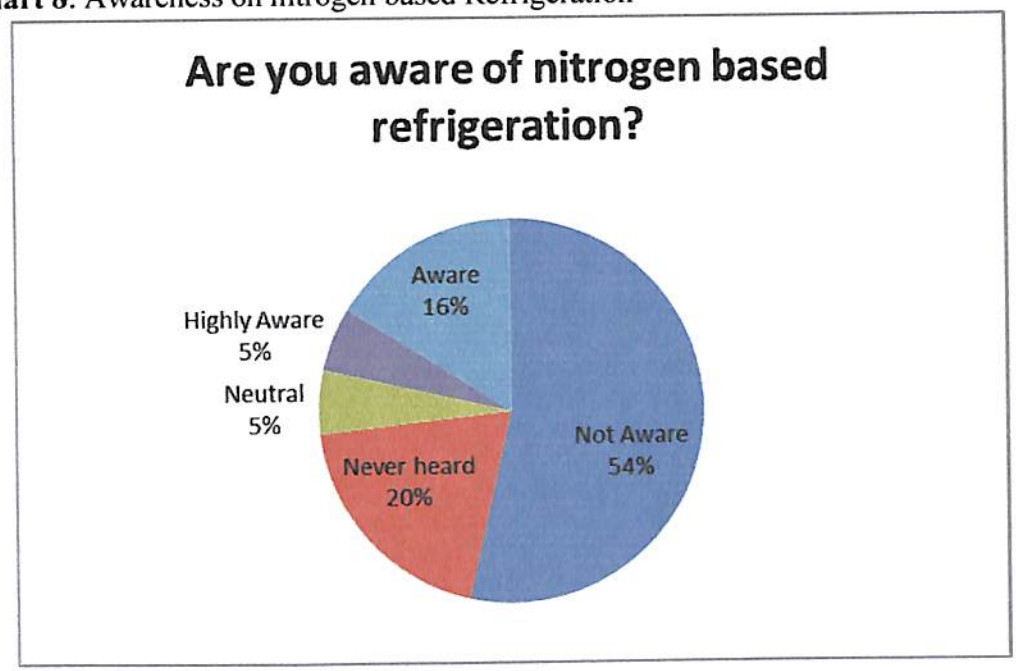
- If we check we can see that Mumbai has more cost charges other than diesel. This is because the toll gate charges and other issues are more in this route.

When it comes to the case of open truck the change will be in the consumption of diesel only. The open trucks have a mileage of 5-6 kilometers on an average. But since the focus is on the isolated trucks only that has being demonstrated.

9.14. AWARENESS REGARDING CRYOGENICS AND ENVIRONMENTAL POLLUTION

This was a question put forward in order to check the awareness about nitrogen based refrigeration among the people. If they are aware about this then it will be easy to introduce the product into the market.

Chart 8: Awareness on nitrogen based Refrigeration



As we could predict nearly 80% of the people were not aware of such a system. This suggested that proper awareness is to be given to the customers regarding the nitrogen based refrigeration which is about to be introduced. Then there was also a very interesting observation that nearly 20% are aware of this system, that is not in transport but they have used cryogenic based refrigeration for freezing fish. It was a very big failure which had given nitrogen based refrigeration a very bad name. it was actually used for precooling usually for freezing a kilogram of fish the cost was in the range of 15- 20 rupees, but using cryogenics it was as high as rupees 45 per kilogram. So due to this very high cost they stopped using cryogenics.

The next aspect which was checked was regarding the high environmental pollution caused the diesel engine. This was to make people understand the negative aspect of diesel engine, everyone responded by saying that they are aware of the pollution. But they were least concerned about that. The main reason being there are no other alternatives to avoid that. Then when asked regarding the pollution free aspect of nitrogen based refrigeration majority wasn't aware of that. The main reason being due to unawareness regarding the technology. But the question helped in making them understand that nitrogen based refrigeration is environmental friendly.

9.15. FISHING IN DEEP SEA

In Vishakhapatnam the fishing in the deep sea is done in the following ways.

- The trawler goes the deep sea for 2-3 weeks. It anchors in a particular location and starts fishing
- It has minimum of two boxes which has insulated properties. They are having a capacity of 500kg.
- The required quantity of ice is also put in that box.
- When fish is caught they are transferred to the boxes
- They can store the fish for around 2 days without any damage.
- The fish which is caught is transferred to smaller boats which come to the trawler on regular intervals.
- The smaller boats bring, ice, food, diesel and other requirements for the trawler. On the return trip the fishing boats carry back the fish.

Scope of cryogenics: There is an area in which cryogenics could be applied. During the monsoon season the trawler gets stuck in the sea. It is very difficult for the smaller boats to reach the trawler. Due to this the trawler runs out of ice. So the fish gets damaged. During the rainy season usually the damage of fish will be very high due to this reason. So nitrogen based refrigeration could be used here. But the problem is regarding refilling of the cylinder. Whereas implementing diesel based refrigeration will be much easier since diesel is easily available.

9.16. ACCEPTABILITY OF NITROGEN BASED REFRIGERATION

A detailed description regarding the project was given to the people interviewed so this question was introduced in order to find out whether the people would buy the product. As expected majority of the sample were ready to accept the system. Almost 62 % were ready to accept the nitrogen based refrigeration system.

But the thing to be noted is that 38% were either neutral or were not ready to accept technology. The reasons for this are as follows.

- High cost – many were very much dissatisfied by the cost of the system. They considered this as a very high initial investment.

- Bad impression by nitrogen based refrigeration – nitrogen based refrigeration was used by many companies for freezing fish. The cost was very, so they stopped using such a system. They were very much reluctant to accept that technology in transportation.

- Low cost of refrigeration system- the cost of refrigeration system used by them was around the range of 3lakhs so comparing to that they were not ready to accept the new technology.

- High satisfaction level of the current system – they were satisfied by the current system so they didn't find any need of trying out any new system.

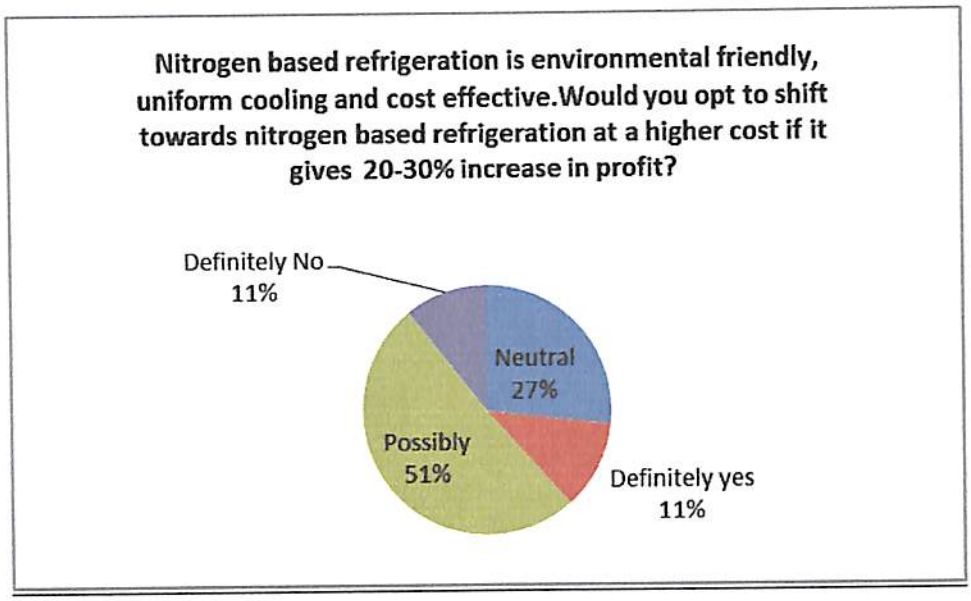


Chart 9: Shift to nitrogen based refrigeration

But still according to the finding the project will be well received. so it could be really tried out in the market.

9.17. EXPECTED RETURN ON INVESTMENT AND PRICE

- According to the survey the expected return on investment is less than 2 years.

Only very few suggested that it can be somewhere around 2-2.5 years. But the thing is that more than 80% wants it before 2 years. The major reason being the very high cost of the system. The project will be successful only if the payback is less than 2 years.

- Everyone wants the product to be available at a price less than or equal to eight lakhs maximum.

This indicates that the price of the cylinder is to be reduced. The best possible price in order to attract the customers will be in the range of 5-6 lakhs. Otherwise it will very difficult to market this product.

9.18. EXTRA TRANSPORTATION COST ON CRYOGENICS

With the application of cryogenics the dealers will be ready to pay more rent. On an average then are ready to pay a maximum of more than 50% on the current transportation cost. This will give profit to both dealer as well as transporter. So this is one of the major aspects which is to be looked forward when the financial analysis is conducted.

The other maintenance and down time aspect of the truck is not being considered. This is because the usage of refrigeration system is not there. The maintenance cost incurred by the truck is just the normal cost of maintenance.

10. FEASIBLITY STUDY

Based on the above analysis whether cryogenic cylinder based refrigeration is possible in transport truck is analyzed.

Following as the analysis which will be conducted:

i) Market opportunity
ii) Technical feasibility
iii) Financial feasibility
iv) SWOT analysis
v) Environmental feasibility

10.1 MARKET OPPORTUNITY

- Limited market opportunity- the system was initially intended to replace the diesel based refrigeration system. But now it is evident that majority of the trucks are open trucks. So the opportunity lies in refrigerated trucks and the insulated trucks.

- Insulated trucks – in insulted trucks cryogenic cylinder can be easily installed. It could actually replace the ice. So almost double the quantity of fish could be transported due to this. In insulated trucks fish is being transported mainly to kolkota, cochin, Mumbai and Chennai.

- Refrigerated truck – refrigerated trucks are not used for transporting fish within the country. They are used for transporting the fish to the ports. From bhimavarm to vishakhaptanm it takes nearly 12 hours journey and even some fish is being exported from Chennai port also it takes nearly 18 hours. So in these two rotes the trucks run on refrigerating system it could be replaced by cryogenic cylinder. But the major concern in this area is that the cost of refrigerating system is just 3 lakhs as compared to 8 lakhs of cryogenic cylinder.

- Reduction in wastage – there is nearly 20% of wastage of fish with introduction of cryogenic based refrigeration this could be bought down to nearly zero.

- Dependence on ice could be reduced – now the transportation is majorly dependent on ice. So with implementation of cryogenic ice usage can be completely avoided.

- Chilled fish packing cost could be reduced- the cost of packing 1 ton of fish with ice is 500 rupees. With the use of cryogenics this cost can be eliminated.

- The possible routes are:
  - Vishakhapatnam- Chennai (only 20 hours)
  - Vishakhapatnam – kolkota (only 22 hours)
  - Vishakhapatnam- Mumbai (only 36 hours)
  - Vishakhapatnam – cochin (only 34 hours)

- Bhimavaram – Chennai (only 18 hours)
- Bhimavaram – Vishakhapatnam (only 8 hours)

This route provides a very good opportunity because of the short time taken. All the routes which are covered within 24 hours don't require any refilling. Whereas the Mumbai and Cochin routes which takes around 36 hours for their trip requires only one refilling.

Table 10-Fish trade in vizag

Quantity of fish transported (per day)	80 ton
No trucks travelling per day	16
No of insulated trucks	5
No of open trucks	11

(all details are of a single day, transportation is only to the local market(within India))

- From Vishakhapatnam there are no refrigerated trucks, since refrigerated trucks travel mainly to the ports.
- Out of the 16 trucks the locations to which it travels are as follows:
  - 40% - kolkata
  - 20% - Mumbai
  - 15% - Chennai
  - 10% - cochin
  - 15% - others

Out of this nearly 50% refrigerated trucks travel to cochin and mumbai, almost 30% to kolkata and remaining 20% to other locations.

Table 11:Fish trade in Bhimavaram (West Godavari)

Quantity of shrimp exported(foreign countries)	165-200 tons per day
No of refrigerated trucks travelling to the port	13
Trucks to Vishakhapatnam port	8
Trucks to Chennai port	3
Trucks to krishnapatnam port(near Nellore)	2

(detail of fish export)

- All the trucks which are used for export purposes are refrigerated trucks.
- Mainly shrimps (prawns) are exported abroad. Fish are very rarely exported.
- Nearly 70% are loaded from vishakhapatnam port, 20% from Chennai port and 10% from krishnapatanm port (near vellore).

Table 12 : Fish Trade To Local Market From Bhimavaram

Quantity of fish transported (per day)	2000 ton
No trucks travelling per day	200
No of insulated trucks	20
No of open trucks	180

(fish transported to local market)

The percentage of insulated trucks in bhimavaram is very few. In the survey we could find that only less than 10% of trucks are insulted. Remaining 80% are open trucks. So in the local market the project couldn't be implemented.

10.2 TECHNICAL FEASIBILITY

Technical feasibility is not a question for this product. Cryogenic cylinders are being used successfully for refrigeration in foreign countries. But the thing is like its feasibility in Indian context has to be analyzed

- Installation in an insulated truck – the insulted truck which is being used should be suited for the cryogenic cylinder. If it lacks properties to stop the different forms of heat transfer then it won't be technical feasible.

- Uniform cooling in airtight packing – the plastic and thermocol boxes are arranged in an airtight packing. So the arrangement of the boxes should be in such a way that it could provide uniform cooling to all the boxes.

- It should not affect the outer layer of the fish – in this case cryogenics is very much technical feasible. It doesn't affect the flesh of the fish in way.

- Constructing a lower priced cylinder – the price was a major issue for the customers. So a new design or new technical changes could be made that could reduce the price of the product.

The other area were they could be used is in ships. But the transportation using current refrigeration system is very cheap. It also takes nearly 20-40 days for transportation. So in this case it is not feasible. But if the cryogenic based refrigeration could use less quantity of nitrogen this could be implemented.

REFILLING STATIONS

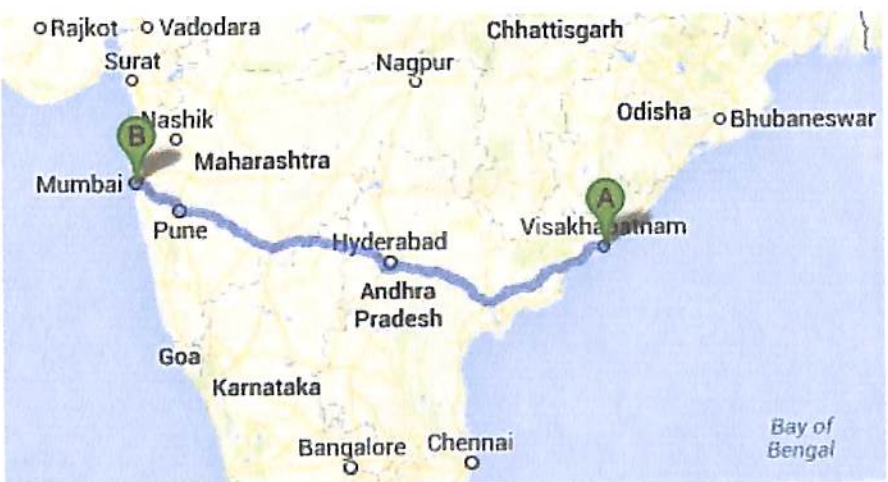
More than all of this the major availability is of the refilling stations. Without refilling stations the project.

1. Vishakhapatnam – Mumbai

Table 13: Refilling station: Hyderabad

1.	AP Industrial Gases LTD C-37&38 Industrial Estates, Sanath Nagar, Hyderabad - 500018 ,Call: (040) 23701710
2.	Sigmatech Scientific Products Plat No 77, G-1, SAI Nilayam, Jaya Nagar, Kukatpally, Hyderabad – 500072,Call: (040) 64534491
3.	Srinivas Air Freshners & Cleaning Liquid... 1-1-32/2051, Beside Saibabanagar Bus Stop Lane, Saibaba Nagar Colony, Kapra-Secundrabad, Hyderabad - 500762 Call: 9866125680
4.	Pharmatek Scientific Systems MIG 315, New Balaji Nagar, Kukatpally, Hyderabad - 500072 ,Call: 9849180226

Fig 9:Route map: Vishakhapatnam to mumbai



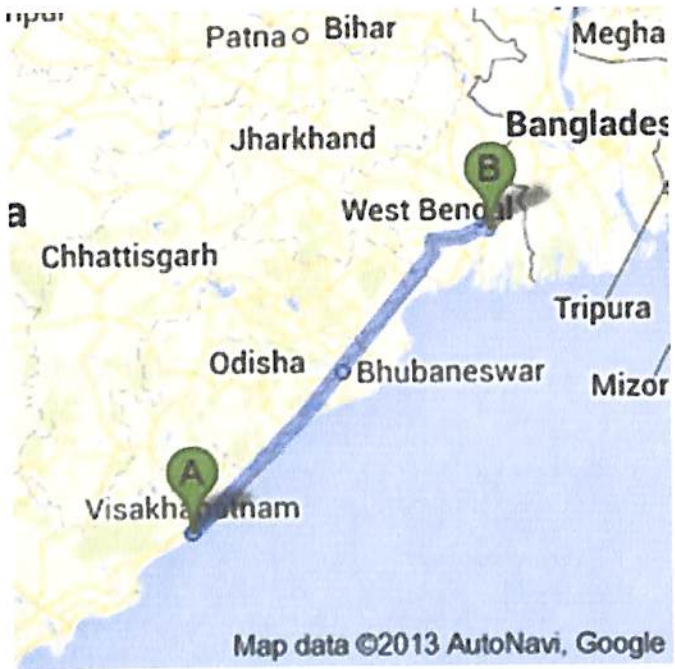
2.Vishakhapatnam – kolkota

This is one of the other best possible route.

Table 14:Refilling station: Bhubaneswar, Kolkata

Bhubaneswar	kolkata
Sree Venkateswara Carbonic Gases Pvt Ltd No 9/84, Lajapathirai Street, Ram Nagar, Coimbatore - 641009 (Also serves BHUBANESHWAR)	**Ellenbarrie Industrial Gases LTD** 194, G T Road North, Salkia, Howrah - 711106 Call: (033) 26558090

Fig 10:Route map: visakhapatnam to kokata

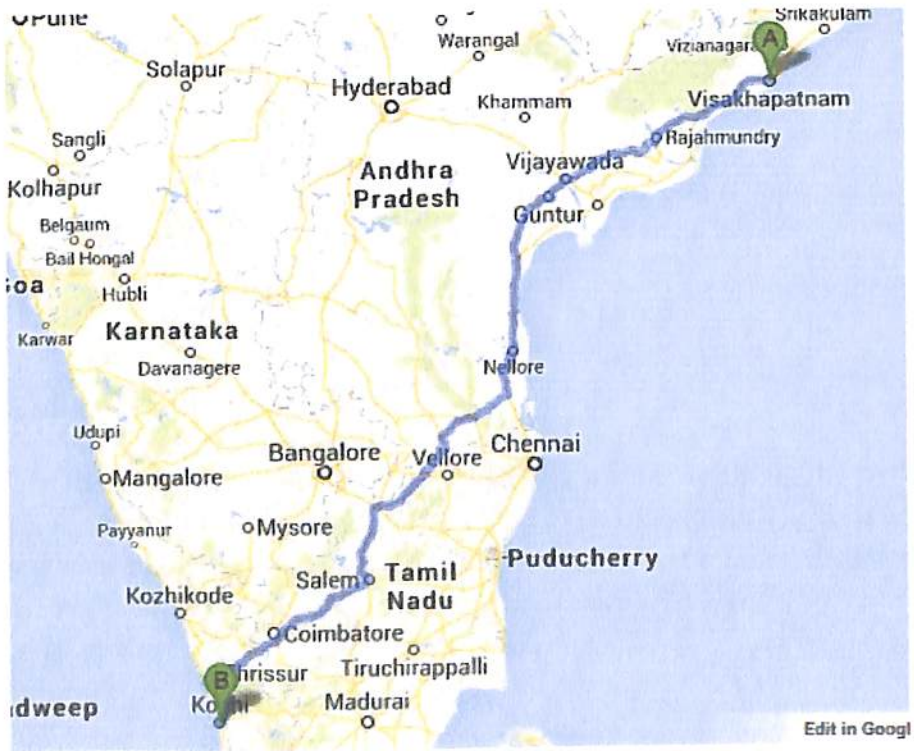


3. Visakhapatnam to cochin

Table 15: Refilling station: vijaywada, Nellore, salem kochi

Vijaywada	Nellore	Salem	Kochi
Sree Venkateswara Carbonic Gases Pvt.Ltd No 9/84, Lajapathirai Street, Ram Nagar, Coimbatore - 641009 (Also serves VIJAYAWADA) Call: (0422) 2230846, 9443130846	Tapan Oxygen 28 A, Sahjanand Arcade, Near Helmet Cross Road, 132 Feet Ring Road, Memnagar, Ahmedabad - 380052 (Also serves NELLORE) Call: (079) 27911379, 9377758335	Rajee Gas Agencies No 2/9-B, Behind Salem Castle, Perumal Koil Street, Swarnapuri, Salem H O, Salem - 636001 Call: (0427) 2442207	S B Gas Agencies No.35/105, Puthenpurakal Road, Palarivattom, Ernakulam - 682025 Call: (0484) 2341461

Fig 11:Route: Vishakhapatnam to cochin

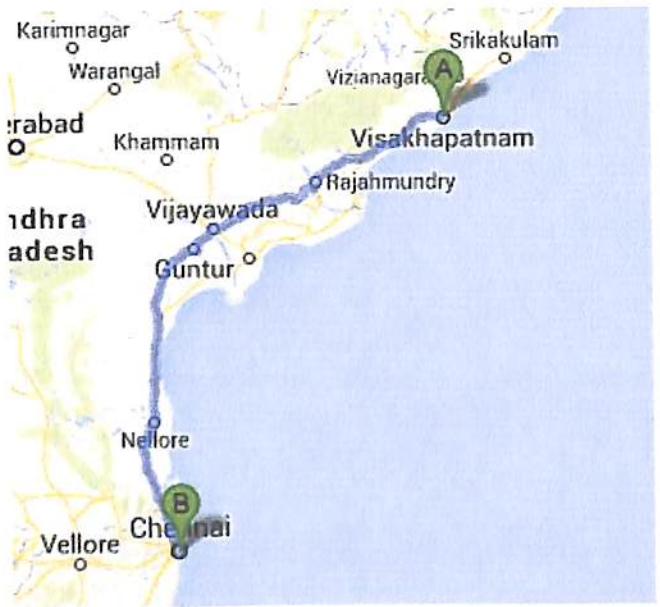


4. vishakhapatnam - chennai

Table 16: Refilling station: vijaywada, Chennai

Chennai	Vijayawada
SreeVinayaka gas agency Tiny sector, Ambattur industrial estate, Chennai, mob:+91-44-66591680	Tapan Oxygen 28 A, Sahjanand Arcade, Near Helmet Cross Road, 132 Feet Ring Road, Memnagar, Ahmedabad - 380052 (Also serves VIJAYAWADA) Call: (079) 27911379, 9377758335

Fig 12:Route: Vishakhaptanam to Chennai.



10.3. FINANCIAL FEASIBILITY

The main concern in the financial feasibility will be regarding the payback period. Since the value of money changes with time, discounted payback is to be calculated. The following financial feasibility which is being calculated is for Kolkata in an insulated truck. This is because the feasibility of project is mainly in this area. Then the main area to apply this is to the **dealers who have their own truck.**

Calculation:

Location: kolkota

Type of truck: insulated

Quantity of fish transported without cryogenics: 4 ton fish + 4 ton ice

Transportation cost: rs.20, 000

Transportation cost: rs.5

- With the use of cryogenics: quantity transported = 8 ton
- Transportation cost(per kg) = 20,000/8000 = rs.2.5
- Saving in transportation cost = rs.10,000
- Saving in ice (rs.1500/ton *4) = rs.6000
- Cost of ice packing(rs.500*4) = rs.2000

Total profit = (rs.10,000+rs.6000+rs.2000) = rs.18,000

- Consumption of nitrogen = (10 liter/hr *22 hours) = 220 liters
  = 220 *15(rs 15 per liter)
  = rs.3300
- Extra earnings per trip = (18,000-3300)
  = rs.14700
- Number of trips in a month = 3
- Earnings in a year(3*12*14700) = rs.529200

➢ Payback period = rs.(850000-529200)/529200
= 1year + .60619*12
= 1 year 7 months.

Return on investment= 1 year 7 months

PROFIT FOR TRANSPORTER AND DEALER

Transportation cost charged by a transporter
For a trip to Kolkata = rs. 30,000

Extra transportation cost charged = rs.50, 000

Extra cost incurred (220l*15) = rs.3300

Extra profit = rs.16,700

Earnings per year(3*12*16700) = rs.601200

The rate of return will be just above 1 year in the case of transporters.

- Whereas to buyers will have a profit as follows

Transportation cost =rs.10,000
Cost of ice = rs.2000
Cost of packing = rs.2000

So the dealer will have a profit of rs.14,000 per trip.

10.4 SWOT ANALYSIS

STRENGTH	WEAKNESS
➢ Uniform cooling ➢ Zero wastage ➢ Zero usage of ice ➢ Zero maintenance ➢ Environmental friendly	➢ Negative impression by nitrogen cooling ➢ High cost ➢ Availability of refilling station
OPPORTUNITY	**THREAT**
➢ Insulated truck ➢ Refrigerated truck(travelling towards the port) ➢ Open truck(if fitted with container and cylinder)	➢ Ice factories ➢ Refrigeration system ➢ Availability of nitrogen

This is the SWOT analysis of cryogenic cylinder. The main thing to be noted is that the availability of refilling stations. If the truck has any maintenance problem the run time will be increased this could result in the cylinder running out of nitrogen. So this is to be sorted out.
As explained the main scope lies in insulated truck and the refrigerated truck which is travelling to the port.

10.5. ENVIRONMENTAL ANALYSIS

- No special environmental analysis was taken
- Since nitrogen is an environmental gas there won't be any environmental issue.
- Compared to nitrogen there is no pollution at all
- In the survey questions were asked in order to make people understand about the pollution free characteristic of cryogenic and the pollution of diesel.

11. CONCLUSION

- Partial feasibility – from the survey it was found that majority of the trucks running are open trucks. In these cryogenics couldn't be applied. So the scope is in the insulated trucks which are only 11%. Then in the case of refrigerated trucks also it could be implemented. But nitrogen based refrigeration cost is too costly as compared to refrigeration system.

- Best possible route: the best possible rout for the project is Vishakhapatnam to Kolkata. This is because in this route the journey time is just 22 hours. So the truck could actually travel without any refilling.

- Cost too high: majority of the people find the cost of cryogenics very high. So it would be good if the cylinder is introduced at a cost of rs.5-6 lakh it will be accepted easily.

- Proper awareness is to be given: since this technology has not being used the customers are having lot of confusion regarding the product. So proper demonstration as well as awareness is to be given to the customers.

- Best possible locations: the best possible location for insulated trucks is R.K beach. This is because the insulated trucks are mainly travelling from this location only. From the bhimavaram location there are no such trucks according to our survey. Then whereas in the case of refrigerated truck the best possible route will be from bhimavaram. Many trucks are travelling to offload fish at the vishakhapatnam. So this could be the best possible route.

- Refilling of nitrogen : almost everyone is concerned with the refilling of nitrogen. So in order to make it feasible in the best possible way the availability of nitrogen should be made sure. The correct locations regarding the refilling stations should be also mentioned in advance.

- Competition with refrigerated system: people are very much satisfied with diese based refrigeration. So the product should be marketed in such a way that they can win over its competitors.

- Tackle the shift of ice to cryogenics – the ice packing procedure is in use for a long period. There are a lot of ice factories depenend on this. So with the introduction of cryogenics this monopoly of ice factories will end. So they can create a campaign or something against cryogenics. It should be very much intelligently handled.

12. RECOMMENDATIONS

- Reduce the cost of the product: there has to be some changes made in the cost during initial launching of the product. Otherwise the customers won't be attracted in any way. According to the survey it was found out that customers were very much price sensitive.
- Refilling stations: in the longer term of the project cryogenics could be introduced in these routes.

Vishakhapatnam-Mumbai route
Vijayawada, Hyderabad, solapur, pune,Mumbai - refilingstations

Vishakhapatnam-kolkata route
Bramapur, bhubaneswar ,balasore, kolkata – refilling stations

Vishakhapatnam-Cochin Route
Vijayawada,vellore,salem,coimbatore.Cochin – refilling stations

Vishakhapatnam-Chennai
Vijayawada, nellore, Chennai – refilling stations

Refilling stations are required at these points inorder to avoid the regular maintenance problems that could occur. The truck might have a break down so it will increase the time of journey. So at regular intervals nitrogen filling stations should be made available.

- Start the project with dealers+transportes : this will be the best area to start the project. Target the fish dealers who have their own trucks. This is because if it has to be implemented in pure transporters then the company will have to convince both transportes and dealers.

- Implement cryogenic cylinder in refrigerated trucks in bhimavaram area- from this location a lot of trucks are being going the vishakhapatanam as well as Chennai port. So the cylinder on a test run can be used in this area. There is also refilling station available in Vishakhapatnam

- Marketing cylinders along with containers- the cylinders could be marketed along with insulated containers. But the thing is that there is not standardized company providing such containers. Local fabricating companies are providing this, they can be contacted and cylinders could be provided along with them. This can also reduce the installation cost.

- Providing cylinders on installments- as an initial step the cylinders could be provided on the cost prie, the rest amount can be collected after a particular period. So the customers won't be much burdened on the cost.