Automatic Transmission Of Liquid Nitrogen

Sumedh Mhatre, Nikhil Vartak, Anuradha Pandey, Ankita Jathar

Abstract: Liquid Nitrogen is one of the major substance used as a chiller in industry such as Ice cream factory, Milk Diary, Storage of blood sample (Blood Bank) etc. It helps to maintain the required product at a lower temperature for preservation purpose. We cannot fully utilise the LN2 so practically if we are using 3.75 litre LN2 for a single day then around 12% of LN2 (450 ml) is wasted due to vaporisation. A pressure relief valve is provided to create a pressure difference. If there is no pressure difference between the cylinder carrying LN2 and its surrounding it will results in damage of container as well as wastage of LN2.Transmission of LN2 from TA55 to BA3 is carried manually .So care must be taken for the transmission of LN2 in order to avoid its wastage. With the help of this project concept the transmission of LN2 will be carried automatically so as to reduce the wastage of LN2 in case of manual operation.

Keywords: Air compressor, Input container (TA26), Inlet pipe, Pressure gauge, Outlet pipe, Output container (BA3), microprocessor

I. Introduction:

Liquid nitrogen is a cryogenic liquid and it is in a liquid state at an extremely low temperature. Liquid nitrogen is a colourless clear liquid with density of 0.807 g/ml. It freezes at 63 K. It is used for the cryopreservation of blood, reproductive cells (sperm and egg), and other biological samples and materials as well as to store cells at low temperature for laboratory work. Animal Husbandry is the branch of science, which deals with the study of various breeds of domesticated animals and their management for obtaining better products. In animal husbandry department liquid nitrogen used for preserving semens sample in semens straw. BA3 container with conister use for storing purpose. . This tank is a large, vacuum-sealed, aluminium refrigerator encased in an extremely efficient insulation system. To ensure maximum liquid nitrogen holding times, the tank should be stored away from direct sunlight in a cool, clean, dry, dust-free, well ventilated environment that can easily be reached daily. Liquid nitrogen work as chiller. This semens carried by canister. Conister Height 120mm. conister deep inside the liquid nitrogen. In veterinary clinic TA55 is use for storing liquid nitrogen. Liquid nitrogen transfer to BA3 container by manually process. This process is dangerous and time consuming. Most of LN2 get waste by vaporising. TA55 having 51.5lit capacity and static evaporation rate is 430ml/day. Due to vaporisation of LN2 doctors get only 48lit LN2 to use. Doctor use BA3 container during ARTIFICIAL INSEMINATION (AI). Artificial insemination (AI) is the deposition of semen in the cervix by the artificial means. It is a useful technique devised for the genetic improvement of farm animals. Artificial insemination is widely used for breeding cattle, buffaloes, sheep, goats, horses, dogs and a variety of laboratory animals.

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- *The project based on Automatic Transmission of liquid nitrogen Under the guidance of Prof.Nikhi desai Students of Mechanical Engineering, Mumbai University-India*

II. Background study:

ZYB type pump use for transmit LN2 .It is china made foot and hand operated pump. These Liquid Nitrogen Pump ZYB-5/ZYB-8 are designed by making use of hand aspirated type ball (ZYB-5)or foot cylinder (ZYB-8), a little of liquid nitrogen inside is vaporized, the liquid nitrogen inside the container is pressurized due to the high gas/liquid ratio of liquid nitrogen, so as to release liquid nitrogen from container automatically. It is easily operated, reliable with features of safe releasing and lower vaporizing loss ratio.

III. METHODOLOGY:

1. 12 Volt DC supply given to the compressor .reciprocating air compressor is use for high pressure with low discharge.
2. When process starts compressed air passes inside the TA26 container. Due to continues vapor taking place inside the container LN2 lift up through inlet pipe which is made up from ms material.MS commonly use as corrosion resistant.
3. Pressure gauge sense the pressure attach to the upper side of inlet pipe. Pressure relive Valve use for pressure difference.
4. For Outlet pipe cryogenic pipe is required .we are selecting high pressure capacity pipeline as like diesel line.
5. Output container (BA3) IS biological type veterinary doctor use this in AI process.BA3 having 3 lit LN2 storage capacity. Canister kept inside it.

IV. Model Diagram:

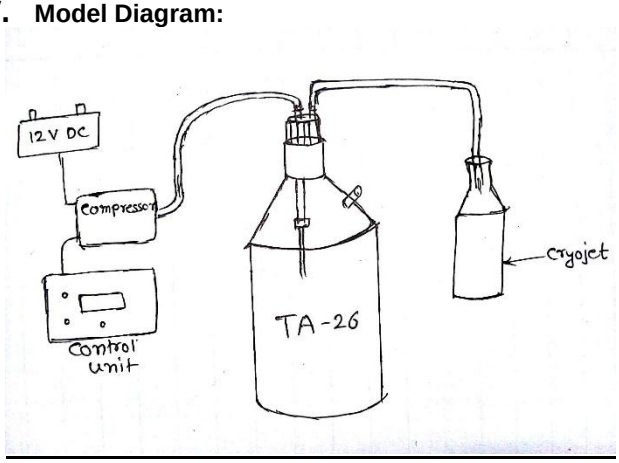

Fig.1-A. *Setup Diagram*

***Fig.1-B**. Actual Setup*

V. Components:

Following are the major components involved in the project
1.1 Air Compressor
1.2 Inlet Pipe
1.3 Input Container
1.4 Outlet Pipe
1.5 Output Container
1.6 microprocessor

1.1 Air compressor

There are various compressor designs: Rotary vane; Centrifugal & Axial flow, Lobe, and Reciprocating. The main advantages of the reciprocating compressor are that it can achieve high pressure ratios but at comparatively low mass flow rates and is relatively cheap. Reciprocating air compressor use for high pressure and low discharge. 12 volt DC power required to drive this compressor.

***Fig.1.1.** Air Compressor*

1.2 Inlet pipe

Brass pipe use as corrosion resistant material.
Pipe diameter - 0.5mm
Pipe length - 350mm

***Fig.1.2.** Inlet Pipe*

1.3 Input container

We are selecting TA26 LN2 Container .TA55 is heavy in weight and construction. Evaporation rate of TA26 is 250ml/day.

Total Height-720mm
Weight-32kgs
Capacity LN2-25.5lit

***Fig.1.3.** Input Container*

1.4 Outlet pipe

LN2 is cryogenic liquid so required cryogenic pipeline.
Pipe inner diameter -0.4mm
Pipe length-650mm

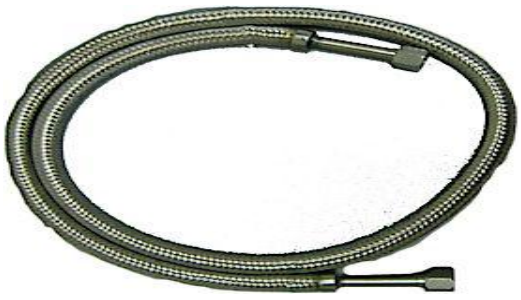

***Fig.1.4.**Outlet Pipe*

1.5 Output container

BA3 container select for output purpose.
Total height-500mm
Total weight-6.4kgs
Capacity LN2-3.8lit

Fig.1.5.*Output Container*

1.6 Microprocessor

Fig 1.6 *microprocessor 8085*

It used for parallel communication.
It have less storage capacity.
It is 5V 8bit microprocessor.
It is used for controlling the ON-OFF time of compressor and also to start it

VI. Future scope-

I. Precise quantity of LN2 can be transfer by making use of microcontroller.
II. Solenoid valve with on/off circuit use for better performance as well as control.
III. Cryogenic pump can be use

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