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**AMMONIA REFRIGERATING PLANT FOR THE CARRIAGE  
OF FRUIT CARGO ESPECIALLY BANANAS.**

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The Refrigerating Machinery to be placed in large deck house on awning deck abaft Engineers' accommodation to be arranged as per plan. House to have the necessary sidelights and door opening to awning deck, also for escape purposes in case of emergency an extra door to be fitted through bulkhead into Engineers' accommodation, port side.

Large cooler house to be fitted on awning deck in way of forward mast, also similar house in way of after mast, all arranged as per plan, and to suit installation of coolers, fans, etc.

DUTY. The Plant to be capable of dealing with a gross insulated capacity of approximately 260,000 cubic feet, and a bin capacity of at least 214,000 cubic feet.

The duty of the Plant based on cooling the cargo in three days is approximately 2,000,000 B.T.U's per hour. It is assumed that the minimum thickness of insulation in the space will be 8" and the sea water temperature has been taken at 85 degrees Fahr.

COMPRESSORS. One horizontal, duplex, ammonia machine, comprising double acting compressors, each 14" bore x 21" stroke, driven from the tail rods of a compound steam engine, the steam engine being complete with its own condenser and air pump.

The engine will be of the open guide, fork connecting rod type, and to work on two crankshafts so coupled together and arranged that both machines can work together and also independently of each other.

The H.P. steam cylinder to be 16" diameter x 21" stroke fitted with piston slide valve.

The L.P. cylinder to be 28" diameter x 21" stroke and both cylinders to be of sound cast iron, hard, free from all defects, heavily stayed, bolted and keywayed in place on the common bedplate.



All steam glands to be packed with Beldam Packing or equal.

Steam cylinders, valves and gland bushings to be suitable for a boiler pressure of 225 lbs. per square inch and 250 degrees Fahr., superheat. Valve faces and bushings to be of monel metal.

The compressors are of the latest design to be made from special close grained iron castings and fitted with the latest light weight, ring plate pattern, suction and discharge valves. The machine would be complete with all the necessary lubricators, ammonia gauges, steam and exhaust gauges and metallic packing for the compressor gland. A complete set of spanners and tools to be provided.

STEAM CONDENSER. Steam condenser to have solid drawn Admiralty mixture Scovill tubes, rolled brass tube plates 1" thick, Tubes to be externally packed with special brass screwed ferrules and packing at each end.

7 AMMONIA CONDENSERS. Two ammonia condensers each consisting of a rectangular steel shell heavily enamelled with bituminous solution and fitted with ends of steel plate designed for easy withdrawal of the coils. Each condenser shell would contain approximately 6,600 ft. of 1.5/16" external diameter heavy gauge, solid drawn steel coils properly stayed and clipped and externally galvanized. The coil ends to be brought through steel end covers and connected together with steel manifolds fitted with inlet and outlet ammonia stop valves, air purge valve and gauge valve.

7 EVAPORATORS. Two ammonia evaporators and brine coolers each comprising a steel shell containing approximately 6,600 feet of 1.5/16" external diameter heavy gauge, solid drawn steel tube in the form of coils properly stayed and clipped. Coil ends to be brought out beyond the end doors and connected together with steel inlet and outlet manifolds complete with all necessary ammonia stop valves. The shells to be coated with bitumastic solution.

WATER CIRCULATING PUMPS. Two 9" x 10" x 24" C. & J. Weir, vertical, singlex, steam driven, water circulating pumps, the water ends being of cast iron fitted with gunmetal liners.

BRINE CIRCULATING PUMPS. Three 10" x 12" x 12" Dawson & Downie vertical, duplex, steam driven brine pumps, the brine ends being of cast iron, brass fitted.



Steam ends etc. of brine and water pumps to be suitable for a boiler pressure of 225 lbs. per square inch and 250 degrees Fahr., superheat.

BRINE HEATER. One brine heater comprising a cast iron shell containing a nest of copper coils capable of a duty of 2,000,000 B.T.U's per hour.

AIR COOLERS. Eight brine type Air Coolers, two for each Hold, to be built up of grids of solid drawn, heavy gauge steel tube of  $1\frac{1}{2}$ " bore, the total feet run in the eight Coolers being approximately 27,250 feet. Each Cooler would consist of a number of vertical grids arranged with inlet and outlet valves for each section and each section to be fitted so as to be at right angles to the air stream. The Coolers to be fitted in the Cooler Houses fore and aft together with all necessary headers, valves and thermometers. Cooler coils, stays and clips to be galvanised.

AIR COOLER FANS. Two Air Cooler Fans for each Hold to be supplied of Davidson "Sirocco" type or other approved make, each to be direct coupled to 25 H.P. Laurence Scott "Deluge" type Electric Motors, or other approved make. Each Fan to be of the inlet type having a rotor 30" diameter and a maximum output of 29,000 cubic feet of air per minute against a pressure of 2" static water gauge. Each unit to be arranged for a variable speed of 400 - 600 r.p.m. The four forward Fans and the four after Fans respectively to be so arranged in pairs so that in case of breakdown of one of the motors, the remaining motor can drive two Fans together, under which conditions each Fan is to be capable of a duty of 21,000 cubic feet of air per minute. It is assumed that the Air Coolers and Fans can deal with the spaces as follows:-

No. 1 Cooler -	No. 1 Hold and Tween Decks.
No. 2 "	No. 2 ditto.
No. 3 "	No. 3 ditto.
No. 4 "	No. 4 ditto.

CONNECTING PIPES ETC. To have all the necessary ammonia connecting pipes and valves between the various parts of the Plant including a large ammonia Liquid Receiver built up of solid drawn steel, the necessary brine headers, valves and distributing pipes and leads between the evaporators and the various coolers, together with the brine mixing tank, spring balance, all brine thermometers. Engine-room clock and NH<sub>3</sub> gas helmet are also included.



ERECTION. The whole of the Plant to be fitted up on board the vessel, at a quay berth, charged with the first full charge of ammonia gas and calcium chloride brine and temperature test run to Purchaser's satisfaction.

The whole of the outfit to be carried out in accordance with Lloyd's requirements and under their supervision and all to Owner's satisfaction.

The necessary structural steel work of the vessel and machinery seatings to be supplied by Builders, also all steam, drain and water piping, electric wiring and sub-station switchboards and all water and power for tools and for charging and testing the plant.

Builders also to arrange for the provision of cooler trays under the air cooler coils by rivetting to the deck the necessary bulb angles and floating inside the tray with asphalt. Cooler trays to be of steel.

Deck under refrigerating machinery suitably stiffened.

Builders to adequately light the spaces during the carrying out of the work, lift on board and bolt down on to seatings all heavy pieces of machinery and lift all bulk materials into spaces required.

GUARANTEE. We hereby warrant and guarantee: -

That the Refrigerating Machinery including the coolers and other equipment described in this specification will supply sufficient refrigeration to ensure the reduction in 72 hours ( from time the chambers are finally closed ) of the temperature of all the holds filled with bananas to 51 degrees Fahr., and that the return air to the coolers will not exceed a temperature of 53 degrees on the voyage.

That each of the fans described in the specification will when one motor is driving one fan, circulate 29,000 cubic feet of air per minute and when one motor is driving two fans will circulate 21,000 cubic feet of air per minute.

The material and workmanship of refrigerating plant to be guaranteed for twelve months.

WEIGHT. Estimated weight of Cargo Machinery in working order - 250 tons.



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