



International Journal Of Engineering Sciences & Management Research

A REVIEW OF ELECTRICAL MACHINES AND INSTRUMENTS INSTALLED IN DELHI MILK SCHEME

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Keywords: Starters, transformer, boiler, circuit breaker, stator, rotor, multimeter, steam, gauge.

ABSTRACT

The DELHI MILK SCHEME has five different sections, which has a variety of electrical machines and instruments installed according to the plant need. The purpose of this paper is to providing a brief idea about presently installed machines, instruments with their working methodology and capacity along with a comparison of their ideal working states. The Electrical Department controls the power supply of heavy machines and other aid regarding machines. Despite of other instruments the Electrical Department of DMS has using most of the step down transformers to providing the appropriate power supply to the plant systems and 3-phase induction motor to run them with auto transformer and star delta starter, to protect these machines from any fault the circuit breakers and relays of distinct rating are used. The Instruments Section provides the essential sensors and other measuring devices. The Refrigeration Section handles the refrigeration process of cold storage and provides cooling water as an agent to maintain the temperature of the posturizing and other machines. The Boiler department provides the steam for the pasteurization process of milk. Poly pack Section handles the packing of milk.

INTRODUCTION

Delhi Milk Scheme is a subordinate office of Ministry of Agriculture, Department of Animal Husbandry, Dairying and Fisheries, it was commissioned on Nov 01, 1959 by the then Hon'ble President of India, Dr. Rajendra Prasad. Delhi Milk Scheme has been mainly procuring raw/fresh milk from the State Dairy Federations of the neighboring States and some quantity of milk from the Co-operative Societies to augment the supplies with a primary objective of supplying wholesome milk to citizens of Delhi at reasonable prices, as well as for providing remunerative prices to milk producers. It has mainly 5 Sections which deals with the electrical and electronics instruments. These sections are 1.Electrical Section 2.Instrument Section 3. Boiler Section

ELECTRICAL SECTION

The electrical section of DMS deals with follows instruments

- Auto transformer starter
- Star delta starter
- Circuit breaker
- 3-phase induction motor
- Transformers

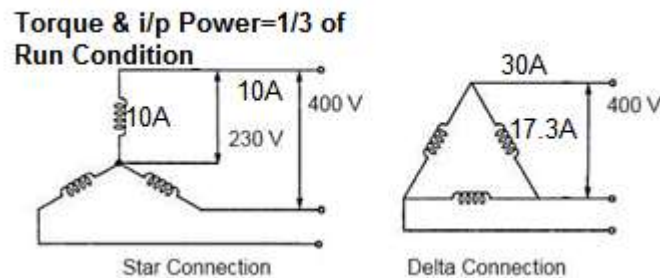
Auto transformer starter:-

Auto-transformer starter consists of an auto-transformer and a switch. When the switch S is put on START position, a reduced voltage is applied across the motor terminals. When the motor picks up speed, say to 80 percent of its normal speed, the switch is put to RUN position. Then the auto-transformer is cut out of the circuit and full rated voltage gets applied across the motor terminals. This can be made push-button operated automatic controlled starter so that the contacts switch over from start to run position as the motor speed picks up to 80 percent of its speed. Over-load protection relay has not been shown in figure. The switch S is air-break type for small motors and oil-break type for large motors. Auto-transformer may have more than one tapping to enable the user to select any suitable starting voltage depending upon the conditions.

Series resistors or reactors can be used to cause voltage drop in them and thereby allow low voltage to be applied across the motor terminals at starting. These are cut out of the circuit as the motor picks up speed

Star delta starter:-

This is the reduced voltage starting method. Voltage reduction during star-delta starting is achieved by physically reconfiguring the motor windings as illustrated in the figure below. During starting the motor windings are connected in star configuration and this reduces the voltage across each winding 3. This also reduces the torque by a factor of three. After a period of time the winding are reconfigured as delta and the motor runs normally.



Circuit breaker

Electrical circuit breaker is a switching device which can be operated both manually and automatically for controlling and protection of any electrical power system. The circuit breakers are used in DMS are:-

- Air circuit breaker
- Oil circuit breaker
- Vacuum circuit breaker

Air circuit breaker

The circuit breaker which operates in air at atmospheric pressure. For interrupting arc it creates an arc voltage in excess of the supply voltage. Arc voltage is defined as the minimum voltage required maintaining the arc.

Oil circuit breaker

Mineral oil has better insulating property than air. The oil is used to insulate between the phases and between the phases and the ground, and to extinguish the arc. When electric arc is drawn under oil, the arc vaporizes the oil and creates a large bubble of hydrogen that surrounds the arc. The oil surrounding the bubble conducts the heat away from the arc and thus also contributes to deionization and extinction of the arc.

Vacuum circuit breaker

Vacuum circuit breakers are used mostly for low and medium voltages. Vacuum interrupters are developed for up to 36 kV and can be connected in series for higher voltages. The interrupting chambers are made of porcelain and sealed. They cannot be open for maintenance, but life is expected to be about 20 years, provided that the vacuum is maintained. Because of the high dielectric strength of vacuum, the interrupters are small. The gap between the contacts is about 1 cm for 15 kV interrupters, 2 mm for 3 kV interrupters. Service life of the VCB is much longer than other types of circuit breakers.

3-phase induction motor

This Motor consists of two major parts:

Stator:-

Stator of three phase induction motor is made up of numbers of slots to construct a 3 phase winding circuit which is connected to 3 phase AC source. The three phase winding are arranged in such a manner in the slots that they produce a rotating magnetic field after AC is given to them.

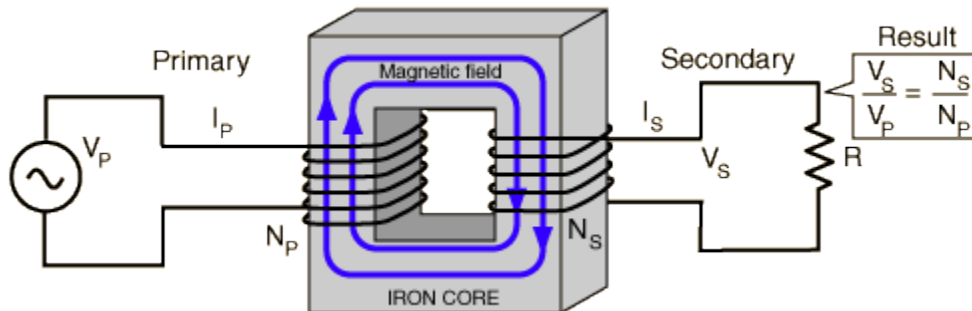
Rotor:-

Rotor of three phase induction motor consists of cylindrical laminated core with parallel slots that can carry conductors. Conductors are heavy copper or aluminum bars which fits in each slots & they are short circuited by the end rings. The slots are not exactly made parallel to the axis of the shaft but are slotted a little skewed because this arrangement reduces magnetic humming noise & can avoid stalling of motor.

The stator of the motor consists of overlapping winding offset by an electrical angle of 120° . When the primary winding or the stator is connected to a 3 phase AC source, it establishes a rotating magnetic field which rotates at the synchronous speed.

Transformer

A transformer makes use of Faraday's law and the ferromagnetic properties of an iron core to efficiently raise or lower AC voltages. It of course cannot increase power so that if the voltage is raised, the current is proportionally lowered and vice versa



INSTRUMENT SECTION

The instrument section of DMS deals with follow instruments:-

- TEMPRATURE CONTROLLER
- WEIGHING SCALE
- MULTIMETER

Temperature controller

A temperature controller is a device used to hold a desired temperature at a specified value. The simplest example of a temperature controller is a common thermostat found in homes

Weighing scale

Weighing scales (weigh scales, scales, etc.) are devices to measure weight or calculate mass. Spring balances or spring scales measure weight (force) by balancing the force due to gravity against the force on a spring, whereas a balance or pair of scales using a balance beam compares masses by balancing the weight due to the mass of an object against the weight of a known mass or masses.

Multimeter

A multi-meter is a device used to measure voltage, resistance and current in electronics & electrical equipment. To measure voltage, connect the leads in parallel between the two points where the measurement is to be made. The multi-meter provides a parallel pathway so it needs to be of a high resistance to allow as little current flow through it as possible

BOILER SECTION

There are two types of boilers

- FIRE TUBE TYPE BOILER
- WATER TUBE TYPE BOILER

DMS has 3 fire tube type of boiler

- IAEC
- RAJDEEP
- WESTERVER

IAEC

- Steam generation capacity-5ton/hour



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- working pressure -8kg/cm
- heating surface-117m²

RAJDEEP

- steam generation capacity-4ton/hour
- working pressure -10.54kg/cm²
- heating surface-123cm²

WESTERVER

- Steam generation capacity-3.5ton/hour
- working pressur-3kg/cm²
- heating surface-99m²

Common part of each boiler

- pressure gauge
- safety valve
- main stop valve
- water level indicator
- heat check valve
- fusible plug

Pressure gauge

It indicates the pressure level inside the boiler and switch the alarm if the pressure goes above the critical level.

Safety valve

It is used to release the excess pressure during fault condition.

Main stop valve

It is used to stop the process.

Water level indicator

It indicates the water level inside the boiler.

Heat check valve

It indicates the heat level inside the boiler.

Fusible plug

It is used to sink down the impurities come with the water inside the boiler. It is mounted at the back of the boiler.

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