

**HITACHI**  
**MEDIUM VOLTAGE DRIVES for**  
**COMPRESSOR APPLICATION**

### **ABOUT HITACHI MEDIUM VOLTAGE VFD SYSTEM**

With a vision of “To be recognized as the most trusted Power Electronics Company by supplying superior products and services”, Hitachi Hi-Rel Power Electronics Private Limited has garnered a significant level of trust in Indian power electronics market segment wherein it serves the entire gamut of Industries.

Variable Frequency Drive (VFD) is a type of adjustable speed drive used in electro-mechanical drive systems to control AC motor speed and torque by varying motor input frequency and voltage. VFDs are used in applications ranging from small appliances to the largest of mine mill drives and compressors.

Hitachi Medium Voltage Drives (Variable Frequency Drives – VFDs) represent the most energy efficient means of process control and reflect the best in process control. Hitachi has a proven & rich experience in manufacturing & supplying drives & automation products with complete customized solutions serving various Industries i.e. Power, Steel & Metal, Cement, Oil & Gas, Mining, Sugar, Pulp & Paper, Water & Waste Water, Rubber, Plastic, etc.

### **ABOUT COMPRESSOR APPLICATION**

A compressor is a device that increases the pressure of a gas by reducing the volume. Recycling compressors designed to provide a steady flow of process gas through a closed circuit in order to maintain the required process parameters in the plant unit.

Compressor can be used in applications including upstream production, midstream production, downstream processing. Compressors are used in many applications, most of which involve increasing the pressure inside a gas storage container.

Compressors are mostly used in the Petroleum refineries, natural gas processing plants, petrochemical and chemical plants, and similar large industrial plants where it requires compressing for intermediate and end-product gases.

In petrochemical refineries types of compressor used are RGC (Recycle Gas Compressor), WGC (Wet Gas Compressor), NGC (Nitrogen Gas Compressor), MUG (Make Up Gas Compressor). BOG (Boil Off Gas Compressor) is used in Natural gas processing plants.

### **CHALLENGE/ISSUES (What are the issues the customer used to face?)**

Earlier, compressors were running through Direct On Line (DOL) starter or soft starter, which causes many difficulties for the operation of compressor.

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In DOL operation, starting inrush current for short duration is very high (6 to 10 times than motor rated current). Due to high inrush current, voltage dip can be observed in the input supply which can trip/affect other equipment as well. Heavy inrush current and jerk effects on interface devices like gear box and coupling and require frequent maintenance, also lifespan of the motor gets reduced after several operation.

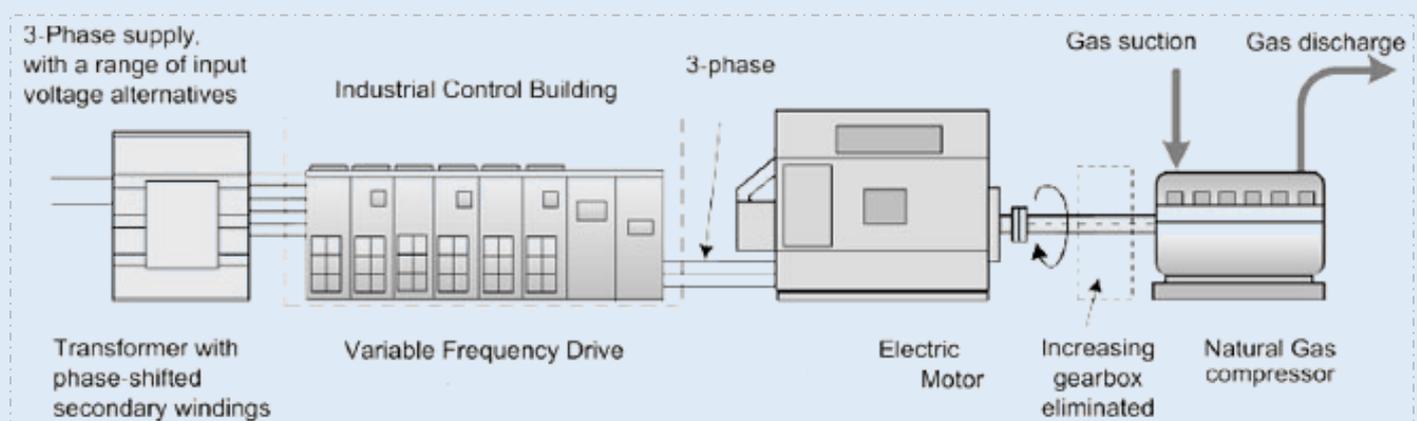
In soft starter operation, starting current can be controlled. However, flow and pressure are controlled & maintained by mechanical valve, it is not possible to control them accurately. This eventually affects all other process parameters, which leads to unstable and unreliable operation and also increase the energy consumption then actual require.

## NEED FOR THE SOLUTION (What is the need for utilizing Hitachi Product?)

- For smother operation of compressors
- To reduce inrush current during motor start-up
- To avoid voltage dip in input supply during motor start up
- To protect gear box and coupling from damage due to starting heavy jerk
- To increase the life of motor by limiting inrush current & smooth start
- To ensure the constant flow and pressure by controlling the motor speed instead of mechanical valve
- To reduce unstable and unreliable operation
- To reduce losses of energy consumption
- To control the process accurately for smother flow
- To stop frequent maintenance of interface devices which caused due to starting heavy current & mechanical jerk.

## HITACHI SOLUTION (How it helps in solving the Challenges/Issues?)

It's highly important to have variable frequency drives for the compressor application to overcome from the problems faced on DOL & Soft starter operation.



Hitachi Medium Voltage Variable Frequency Drive offers;

- **Energy saving** - Variable frequency drive (VFD) controls the speed of motor by supplying the required power, thereby saving good amount of energy which is wasted in DOL/Soft starter operation.
- **Smooth start and stop control** – Controlling the electric motor by VFD, the motor will start accelerating slowly and reach the required speed. Accordingly, the speed during stoppage can be

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reduced smoothly which helps in controlling and stopping the process without any adverse effect to other parameters.

- **Reduced components degradation** – Optimized motor and compressor performance reduces stress on the system's mechanical and electrical components and limiting the component failure. By reducing the motor running speed at certain points in the process, individual components can be placed under less mechanical stress. This change further reduces the pressure on other components such as cables and connectors.
- **Smooth process parameter control** - VFDs are becoming more advanced, and now offering exceptional feedback and monitoring capabilities. Sensors used to detect a wide range of variables, such as pressure, temperature or movement, can be fed into the drive control module to accurately determine the optimal output frequency and motor speed. If a given variable changes, the drive can be set-up to automatically adapt the frequency, altering the speed of the motor. Once the sensors indicate that the desired state has been achieved, the drive can then normalise its frequency.
- **System Reliability** – VFD offers safety features such as short circuit protection and safety torque off (STO) functionality. Selecting a drive with these features can eliminate the need for electrical components, such as motor circuit breakers and contactors, reducing the number of components and therefore costs. Reducing the number of electrical components also increases system reliability and reduces the risk of system downtime.

## BENEFITS OF USING HITACHI MV DRIVE IN COMPRESSOR APPLICATION

- **Lower investment** - Low capital cost on equipment, spare parts and maintenance.
- **Reduced downtime** - VFDs and motors require very truncated maintenance compare to DOL operation. This enables more production, lower maintenance expense, and improved productivity.
- **Smooth and accurate process control** - Accurate speed and process control allows the most optimum plant flow balance.
- **Energy saving** - Higher VFD and motor efficiency, especially at partial load leads to energy savings compared to normal gas turbines.
- **Enhanced Functionality** - VFD provides a very useful speed, current, kW and other useful signal feedback to help in improving process control.
- **Smooth Start** - Lower starting current comparison to a mains-powered motor with direct starting, a VFD can reduce the starting current by up to 80% without affecting the starting torque. By enabling lower starting currents, the energy grid is placed under less stress when motors are powered up, reducing the impact on other local grid energy consumers.
- **Protect electrical equipment** – Lower energy frequency fluctuation reduced the failures of electrical equipment.

## HITACHI MEDIUM VOLTAGE DRIVES FOR COMPRESSOR APPLICATION

### HIVECTOR-HVI-E Series Medium Voltage Multi-Level Drives

Range: Up to 14,700 kVA (3.3 kV to 11 kV)

- **Patented Design** - Increases Reliability
  - Pre-Charging (Reduces charging inrush current of the transformer to less than its rated current)
  - Cyclic Switching of the Cells (Achieves equal utilization of each cell at any operating speed)
- **State-of-the-Art Technology**
- **Tailored to your Specific Application Requirements**
- **Long Term Technical Services and Spares Support**



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- Suitable for Indian Ambient Condition
- Input Harmonics Meets IEEE - 519 - 1992
- Output Waveform - Motor Friendly
- Best for High Starting Torque
- High Efficiency (Typical 97% efficiency including input Dry type transformer)
- Auto Restart, User Friendly and Easy to Maintain

## ABOUT HITACHI HI-REL POWER ELECTRONICS PRIVATE LIMITED

Founded & established in 1983 as Hi-Rel Electronics Pvt. Ltd., which later on in year 2015 had become the 100% subsidiary company of Hitachi, Japan which is one of the Global fortune 500 companies with a new name as Hitachi Hi-Rel Power Electronics Private Limited, which is being recognized as one of the pioneers in power electronics domain. Hitachi Hi-Rel, today, is a leading manufacturer of Industrial UPS, IT & Infra UPS, Medium & Low Voltage Variable Frequency Drives, Grid Tied Solar Inverters, Air Compressors and Railway Inverters.

Hitachi Hi-Rel has state-of-the art manufacturing facility at Sanand near Ahmedabad in Gujarat-India. Hitachi Hi-Rel is helping a wide array of industries and organizations to meet the mission critical demands through technologically superior, low polluting and innovative products Solutions and continue to offer world class power electronics products, value added services & customized solutions.

With a vision of "To be recognized as the most trusted Power Electronics Company by supplying superior products and services", Hitachi Hi-Rel has garnered a significant level of trust in Indian power electronics market segment wherein it serves the entire gamut of Industries, particularly in mission critical applications for Refineries, Petro-Chemicals, Power Generation, Steel & Metals, and Process Industries as well as Critical Data Processing Applications. Besides offering greater energy efficiency & lower carbon footprint, each of the company product streams bears the hallmark of excellence with company accreditations. Hitachi Hi-Rel is an ISO 9001:2015, ISO 14001:2015 & ISO 45001:2008 certified company having export house status. Hitachi Hi-Rel sales network & service infrastructure expands out to the world & with this network, we have made strong inroad in Global markets like South East Asia, Middle East, Africa and Brazil. Also, with a presence of strategically located skilled service engineers in India helps us to score high in terms of customer expectations on service deliverables & uptime of the product.

With expertise, experience and an efficient product line, Hitachi Hi-Rel will always try to be your power electronics partner. When you choose to do business with Hitachi Hi-Rel, you are partnering with a company who cares.

## FOR MORE INFORMATION

To know more about Hitachi Hi-Rel Power Electronics Private Limited and its offered products and solutions, please visit [www.hitachi-hirel.com](http://www.hitachi-hirel.com)

You may also share your requirements at <https://www.hitachi-hirel.com/inquiry> to receive the phone call or Hitachi product information email from our authorized sales representative of your region.

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