Velocity
Customer Newsletter for Industrial Systems

Bharat Bijlee

Customer Newsletter | Issue 5 | February 2020

Enabling Productivity, Precision and Energy Efficiency

70+ years experience

4 million motors

10,000 servo solutions

20,000 gearless machines for elevators

Case Study

Typical Problems in Installation and Commissioning of Motors with VFDs

Customers sometimes report problems in motors operating with variable frequency drives (VFDs): notably, the motor not accelerating, or stalling, or experiencing insulation failure. Some actual problems and their solutions are presented here based on our experience. Due to the wide area of concern, the subject of insulation failure will be addressed in another issue of Velocity.

Problems when used in constant torque applications

When VFDs are used in constant torque mode, the V/f ratio is kept constant (generally 415V/ 50Hz = 8.33).

Due to the stator impedance, the air gap voltage (which creates the flux) is not 415V but slightly lower; it is the supply voltage minus the stator voltage drop (which is equal to the current x impedance). The problem occurs at low frequencies, e.g. 5Hz. The stator drop is almost the same but the air gap voltage is much lower.

For example, considering that the stator impedance is 8 ohms at 50Hz, and 5 ohms at 5Hz (as reactance reduces with frequency but resistance remains the same):

VFD Output Voltage (Volts)	**VFD output frequency** (Hz)	**Current per phase [Line amps /√3]** (Amps)	**Voltage Drop [impedance x amps]** (Volts)	**Air gap voltage [VFD output voltage minus Voltage drop]** (Volts)	**V/f at air gap**
415	50	3.5	28	387	7.74
41.5	5	3.5	17.5	24	4.8

Hence although the VFD keeps the applied V/f ratio constant, at low frequencies the motor cannot develop the rated torque (which is proportional to square of V/f at air gap).

To overcome this, VFDs have an option of providing V/f boost at lower frequencies. The value can be varied based on the application requirements.

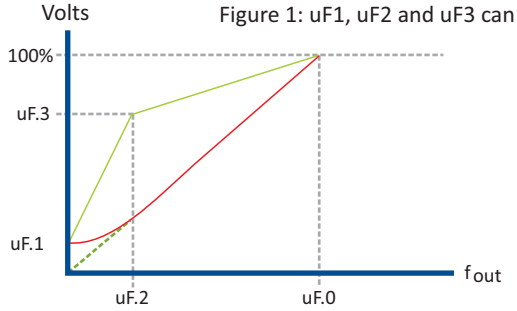


Figure 1: uF1, uF2 and uF3 can be set in the VFD

Get Velocity in your inbox!

By subscribing to our newsletter on this link: https://www.bit.ly/2EcBohF you will receive it by e-mail as soon as it's published.

Bharat Bijlee is synonymous with electrical engineering in India. Our key business lines are Power Systems (Power Transformers, EPC Projects) and Industrial Systems (Motors, Drives & Automation, Magnet Technology Machines). Headquartered in Mumbai, we have sales andservice network across India. The company's manufacturing facilities are located in Airoli, Navi Mumbai on a 1,70,000 sqm. campus.

Two examples of actual problems observed:

1) Hoist manufacturer using our 2.2kW 8 pole motor connected through a VFD: The motor was driving a hoist at two speeds: rated, and creep (1/10th of rated speed). At full speed the motor performance in both Up and Down direction was normal. However, at creep speed (at 5Hz), instead of the specified 6.6mm/sec in both directions, the hoist was observed to move the load at 4.7mm/sec while lifting and 9.8mm/sec when lowering. This was due to the motor developing inadequate torque at 5Hz. Upon giving a V/f boost at 5Hz, the specified performance was achieved in both directions.

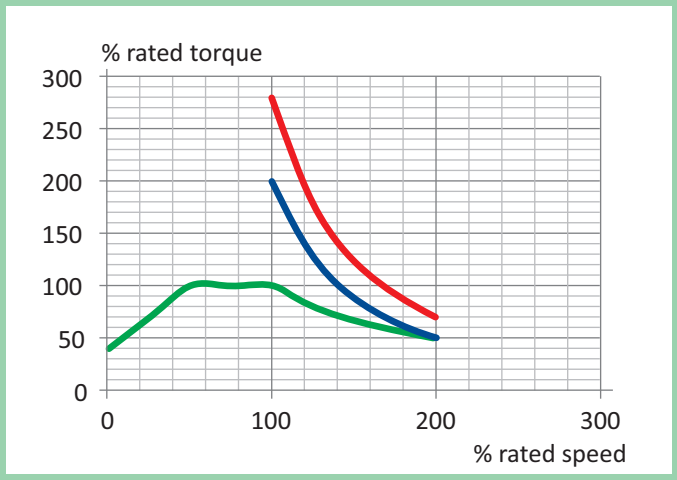
2) Cold rolling mill in an Aluminum Foil rolling mill and a Conveyor in a Steel plant using our motors with VFD: When the motor was started on no load (no billet, or conveyor empty) it accelerated smoothly. However, when started on full load (e.g. restarting after a power failure), it did not accelerate. After analysis and discussion with the customer's engineers, the V/f boost was adjusted so as to compensate for the stator voltage drop. After this adjustment, the motors delivered the requisite torque at low frequency.

It should be emphasized that this solution of V/f boost is required only for constant torque loads at low speeds.

Constant power (Field Weakening) Application: Typical problems at high speeds

The motor operates in a speed range higher than the base speed. Since VFDs cannot increase the voltage beyond the supply voltage, the V/f ratio reduces as frequency increases beyond the base frequency. This results in flux reduction in the motor, reducing the torque. Since the motor is operating in constant power mode at speeds above base speed, the load torque is also reducing, but the motor pull-out torque reduces with the square of speed.

Hence the upper limit of the speed is determined by pull-out torque. This can be seen in the graph below. If the pull-out torque of the motor is 200% rated torque, there is no margin at 200% speed and the motor will pull out. If the motor is to run at twice the base speed, the pull-out torque of the motor should be at least 280% rated torque. This would keep a margin of 40% when running at twice base speed.



Several customers have faced this problem, and have had to subsequently order special motors with high pull-out torque from us.

In general one can select a standard motor for running in field-weakening mode provided the maximum speed is 150% of the base speed. For higher speeds, the motor should be checked for sufficient pull-out torque value. It is advisable that the customer should check with us before ordering a standard motor.

Partner Spotlight

S Sundararaj
M/s Sri Motors
Coimbatore

When did you start Sri Motors? What was the impetus to start it?

I worked with M/s. Beardsell Limited from 1987 to 2005 marketing NGEF and Siemens motors. Subsequently, I decided to start Sri Motors by taking dealership of Bharat Bijlee motors. We started operations in October 2005 from our residence, and later shifted to an office in Industrial Market area in 2008.

What are the focus areas of your business?

We focus on OEM customers because of the recurring business in and around Coimbatore region.

Can you tell us a bit about your market/industries you cater to?

We mainly cater to medium and small OEMs from different industries, offering Textile Equipment, Foundry Machines, Hydraulic Machines, Pumps, Gearbox Manufacturers/ Dealers and Material Handling Equipment.

Since when have you been associated with Bharat Bijlee? What have been some of the key highlights of this association?

We are exclusive dealers for BB and chose to associate with them due to:

- Friendly nature of the company's officials
- Wide range of LT motors (both standard and non-standard)
- Good working culture for long term association

We have developed and retained several valuable OEMs since inception because of the relationship we build with our customers, prompt supply of motors, timely after-sales service involving our own resources in addition to support by BB.

We started with NIL stock in 2005-06 with low range of volume/value. We developed stocking and sales to medium range between 2011 and 2015 and have seen good growth from 2016 onwards. We have become one of the leading dealers in Tamil Nadu state.

What do you look forward to going ahead in your journey with Bharat Bijlee?

We are working to expand our customer base in the region for improving our market share. Our target is to cross annual turnover of Rs. 5 cr. by March 2021 for BB motors.

Paras Jain
M/s Jain Machinery Corporation
Kolkata

When did you start Jain Machinery? What was the impetus to start it?

Jain Machinery planted its seeds in 1997. My family has been in the electrical and machinery business since generations. Through the exposure provided by them and by exploring the market, I kept growing fonder of this sector and soon founded Jain Machinery.

What are the focus areas of your business?

We particularly focus on electric motors, geared motors, crane duty motors, and industrial and domestic pump segments.

Can you tell us a bit about your market/industries you cater to?

Along with the local sub-dealer networks across the districts of Bengal and neighbouring states, we also cater to manufacturers of cranes, steel plants and various other OEMs.

Since when have you been associated with Bharat Bijlee? What have been some of the key highlights of this association?

We have been associated with Bharat Bijlee since long, however our relationship has got stronger in the past two years, i.e. since 2017. Some of the major highlights of our association with Bharat Bijlee has been their prompt deliveries, high quality products, after-sales service and cordial staff behaviour. All of these help us grow efficiently and effectively together.

What do you look forward to going ahead in your journey with Bharat Bijlee?

As we move ahead in this journey, I am definitely looking forward to working as the sole distributor for West Bengal and hope to achieve an annual turnover of Rs. 8 cr.

Welcoming our new Drives & Automation Channel Partner

Hiren Patel
Konica Automation, Mumbai

Promoting our KEB and BL52 drives in Textile industry

BB in the News

We won the **Most Important Supplier** award from Toshiba Machine at their Vendor Meet in Chennai. We supply both motors and drives to them. We are on a hat-trick, having won the Strategic Vendor award from them last year.

We delivered our first 11 kV motor for a Power project. This rating is typically offered in Frame 450, but we supplied compact, energy efficient motors in Frame 400.

We participated in ChemTECH South World Expo 2019 in Hyderabad. We showcased our Hazardous Area motor range for Pharma & Chemical sector.

We were at our partner PERMAGSA's stall at InterLift 2019 in Augsburg, Germany. The stall showcased four of our GreenStar elevator machines, and gave us an opportunity to meet existing and potential new customers from Europe.

We participated in some regional tradeshows - Great India Textile Show in Ichalkaranji and INDOMACH Expo in Nagpur - focussing on our motor and drive products.

Bharat Bijlee

Bharat Bijlee Ltd., Electric Mansion, 6th Floor, Appasaheb Marathe Marg, Prabhadevi, Mumbai 400025

Follow us on ▶ www.facebook.com/bharatbijleeltd www.linkedin.com/company/bharat-bijlee-ltd

We look forward to your feedback. Please write to us on **corp.comm@bharatbijlee.com**