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Gas/Electric Partnership Conf. XVII

VFD Compressor Drives

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VFD Compressor Drives

Agenda

- **Introduction**
- **Compressor Basics**
- **The most common torque load types**
- **Centrifugal torque speed curve example**
- **Summary – Determine the application requirements**

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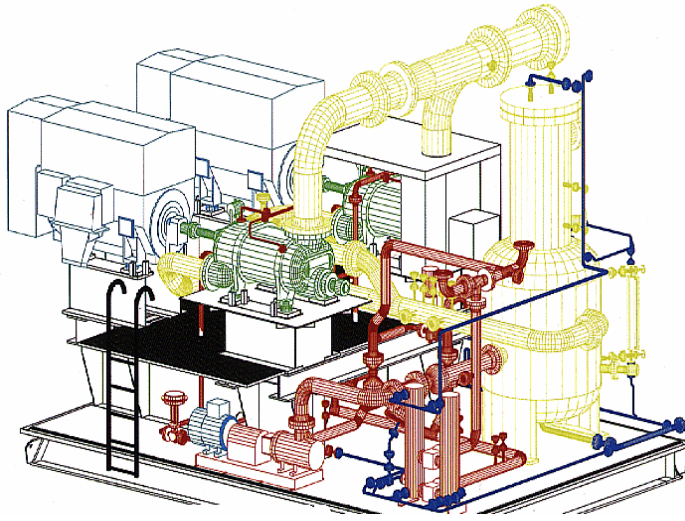
Introduction

- A variable frequency drive system is typically sized for the system nominal point. Most compressors are driven via a gearbox and a 4 pole motor.
- Therefore the nominal point of such a system is defined at 60Hz, or 1800rpm. The motor and the VFD are designed to reach nominal power at 1800rpm.
- The centrifugal compressor has a quadratic load characteristic (torque is proportional to the square of the speed), it is assumed that the power will be reduced with the cube of the speed, for any speed below 1800rpm.
- However, the reality is often different-
 - The compressor is designed for several design points. Many of these points are likely below nominal speed. It often occurs that the VFD system needs to provide more torque than the rated torque at these below rated speed conditions.

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Compressors Basics

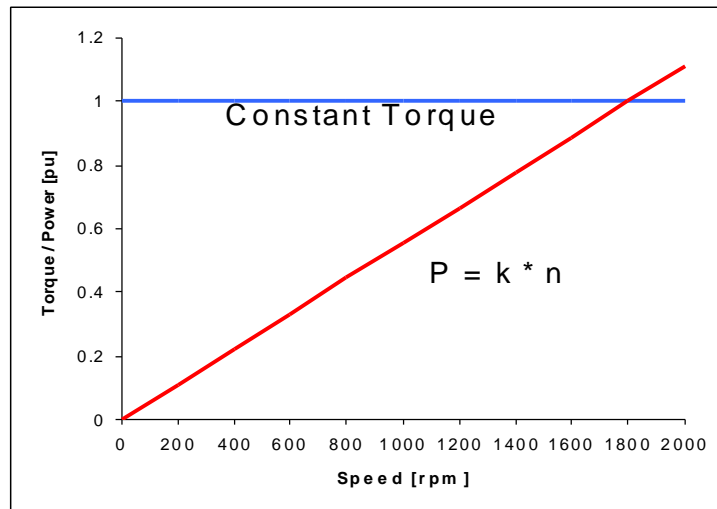
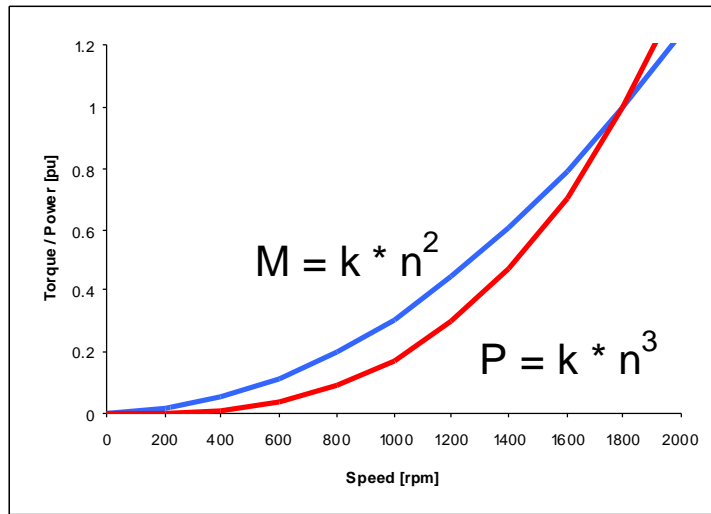


- Centrifugal compressors approximate the constant head – variable volume machine
- Reciprocating compressors are constant volume – variable head machines
- Axial compressors are low head, high flow machines
- With variable speed, the centrifugal compressor can deliver:
 - constant capacity at variable pressure
 - variable capacity at constant pressure
 - A combination variable capacity and variable pressure

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The most common torque load types

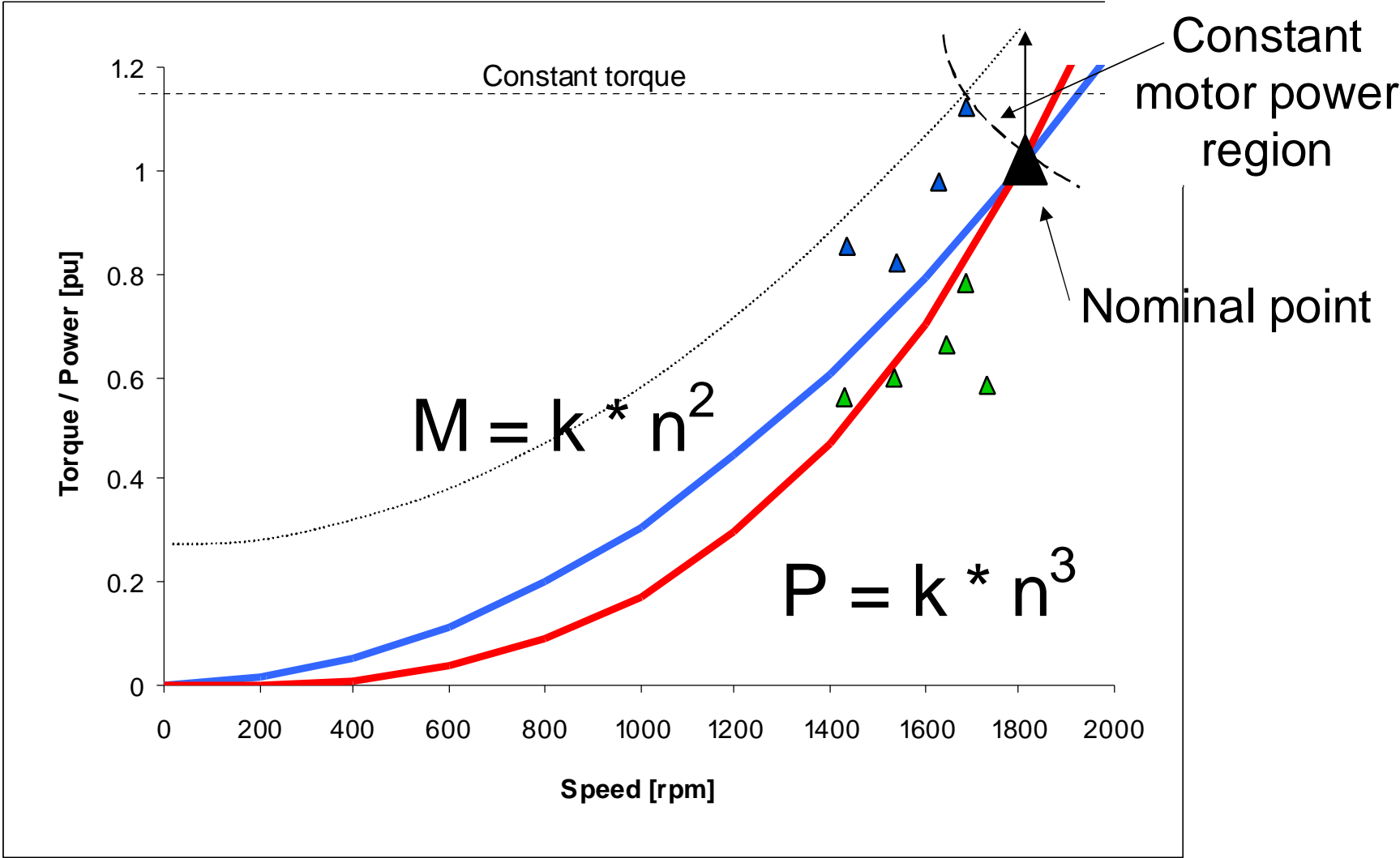


- The most common load type is the quadratic torque.
- The power is cubically proportional to the speed.
- Applications
 - Centrifugal pumps / compressor and fans
- A constant torque load type is typical when fixed volumes are being handled.
- The power increases linear with the speed
- Applications
 - Recip compressors, conveyors

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Centrifugal compressor torque speed curve example



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Summary - Determine the application requirements

- What are the torque requirements?
 - Motor torque (not power) is usually the decisive factor
 - Torque requirements establishes current requirements
 - Torque requirements
 - Constant vs variable torque
 - Define as many operating points as possible
- What is the speed requirement?
 - Maximum speed
 - Minimum speed

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