Selected Chapters from Textile and Single-purpose Machines
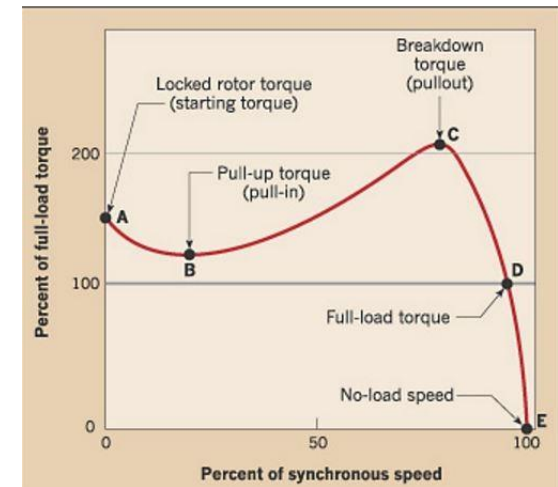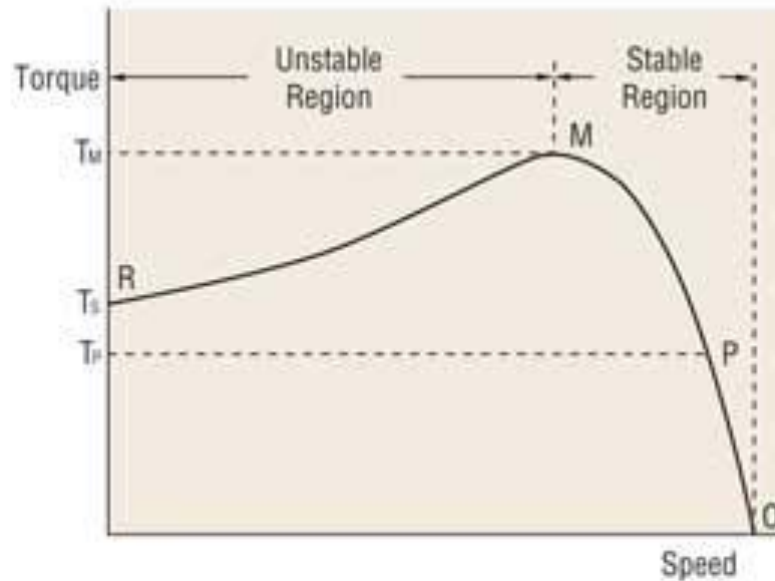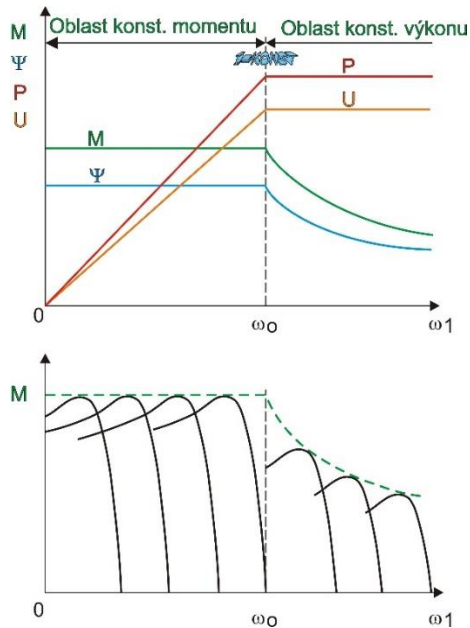
Drive systems in the construction of single-purpose machines II.

Content

- Asynchronous motor control

- Methods used for speed control of an asynchronous motor

Speed/torque characteristic ASM

- M turning point
- P nominal torque
  Stable area
  Unstable area

- A locked torque
- B pull- up torque
- C breakdown torque
- D full-load torque

Asynchronous motor - control

In particular, the following methods are used to control ASM speed:

change of the number of poles - impractical, because the speed can be controlled only in step

slip change - change of rotor power;

by regulating resistance - converting a part of the slip power to heat (uneconomical);

subsynchronous cascade - returning part of power to the electrical network (frequency inverter required due to different ASM and electrical network frequencies);

frequency change - the use of a frequency converter controls the voltage and thus the stator magnetic field generated;
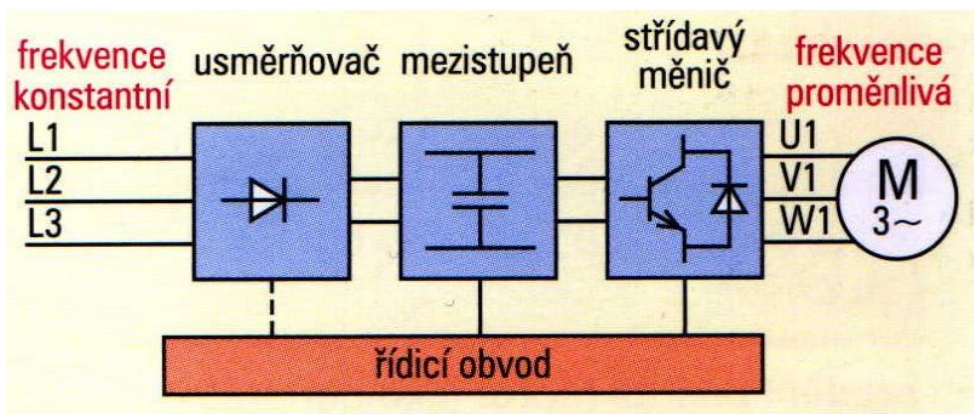
      - scalar control - set the magnitude of the magnetic flux;

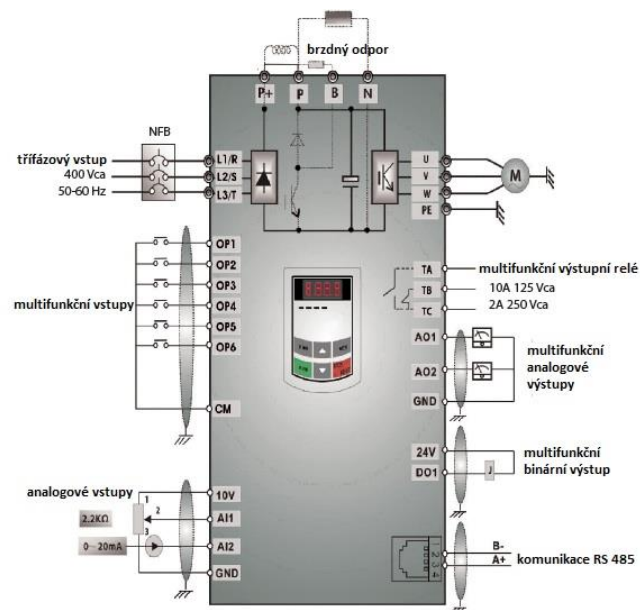   - vector control - set the magnitude of the magnetic flux and its direction

Asynchronous motor - control

ASM Speed Control / Frequency Change - Continuous Control rectifier

Frequency converter diagram

Sizing ASM

- The power of the ASM should roughly correspond to the required power input of the driven machine.
- Usually, however, the ASM power is chosen to be one third greater than the calculation would be. **The ASM is loaded only 75% of its nominal power**.
- At 75% load, the ASM efficiency is the same or even better than at 100% load.
- The ASM also has a favorable power factor cos ϕ at three-quarter load.
- However, the main reasons for this measure are the longer service life of the ASM as the motor is **less thermally stressed** and the reserve of starting torque in case of voltage drop.
- The three-phase ASM torque varies approximately with the square of the supply voltage.

USE of ASM

- The **single-phase** asynchronous motor is used where it is not necessary to control the motor speed during machine operation, for example
compressors in refrigerators, waterworks, woodworking machines, lawnmowers, fans and many other different applications
- It is possible to use a frequency converter powered from a single-phase AC power supply that supplies a three-phase asynchronous motor.
- Speed control of single-phase asynchronous motors by frequency inverters is not often used.

Review

- Draw the speed characteristic of the asynchronous drive.

- List some types of asynchronous motor control.

- Describe the basic approach to designing asynchronous motors.

Thanks for your attention ☺