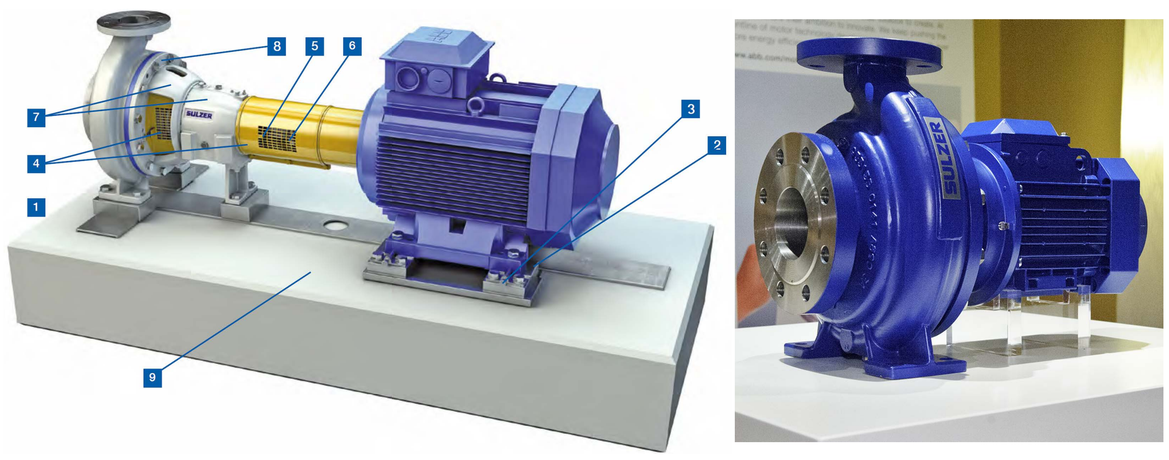
efeu

Efficient Energy Use

Effect of motor efficiency and sizing on the energy efficiency in pumping systems

New motor alternatives are becoming more common in industrial fluid handling systems. Synchronous reluctance and permanent magnet motors increase the system efficiency, but how their sizing affects the resulting system energy efficiency?

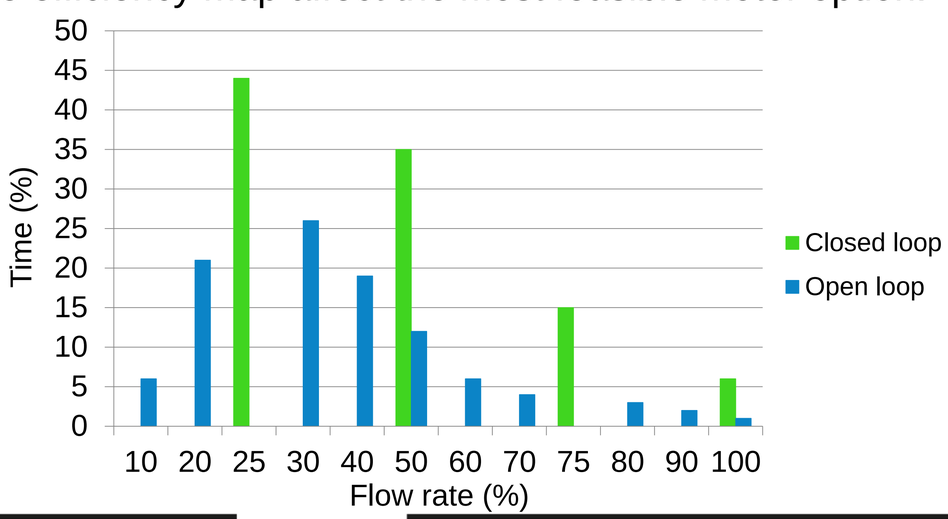
Synchronous reluctance and also permanent magnet motors are nowadays realistic alternatives to the induction motor in pumping systems. Since the energy efficiency index (EEI) classification for pumping systems will also consider the motor efficiency and system control, design of future pumping systems should utilise these benefits without having present standards as limitations.



Typical pumping system vs. integrated EFEU concept device.

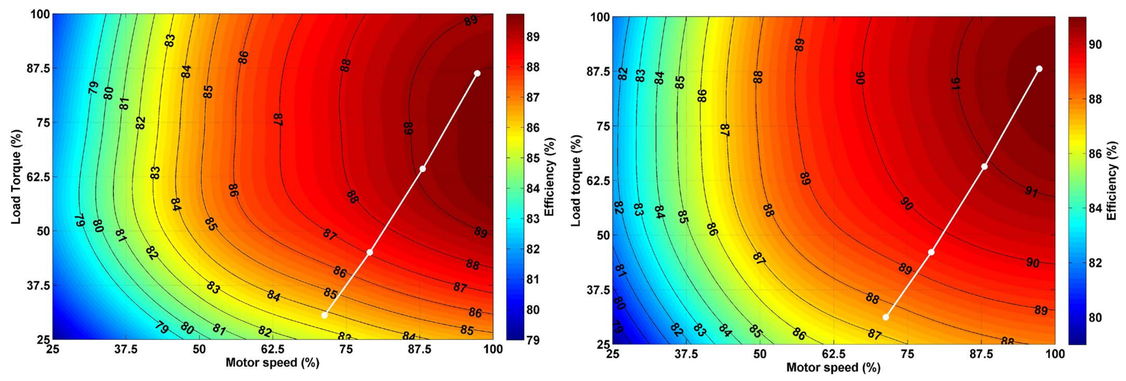
Calculation of annual energy consumption

EEI calculation follows standardised load curves given below. They put emphasis on partial load operation of the pumping system, where also the motor sizing and shape of the efficiency map affect the most feasible motor option.



Effect of motor type on system efficiency

Efficiency maps below summarise how 15 kW induction motor (IM, IE3) and 15 kW synchronous reluctance (SynRM, IE4) operate with a Sulzer 31-100 centrifugal pump. Note how SynRM provides improved efficiency against IM, although it has principally similar construction.



Effect of motor sizing on system efficiency

Several motor sizes in kW may use the same frame size in kg. Therefore, motor sizing should reflect the option of using a larger (or smaller) motor size in kW, if this results in higher system energy efficiency and reliability. Efficiency map of 18.5 kW IE4 SynRM illustrates these benefits through higher efficiency and lower load torque levels. Economical significance of sizing increases directly with annual energy consumption.