APEX RELIABILITY ENGINEERING / COMPONENT LAB

A motor is part of a train

Original reference card | v0.3 | Source text checked 2026-11-19

Generic squirrel-cage induction motor in motoring operation. Other motor families and cooling arrangements differ.

Understand the relationships

Start with the stationary and rotating parts: The stator holds the windings in a stationary magnetic structure.

Field speed and shaft speed are different: For a rotating fundamental field, synchronous speed is ns = 120 f / p in rpm, where f is electrical frequency in Hz and p is the number of poles.

A replacement does not remove the duty: The supply, drive, mounting, cooling, lubrication practice, coupling and process load remain part of the system.

Preserve useful evidence

[ ] Motor family, nameplate/rating and drive or starter identity.

[ ] Time-aligned existing speed/load, temperature and vibration records with duty and method.

[ ] Cooling, lubrication, alignment and intervention history; preserved damage findings.

The next question

Which system condition would still be present after the next replacement?

Keep the limits

Original illustration: 60 Hz and four poles give 1,800 rpm synchronous speed. An assumed 3% slip gives 1,746 rpm shaft speed. This is arithmetic with an invented slip, not a measured motor, a recommended setting or a prediction of torque, current, temperature or life.

Primary sources and scope

U.S. Department of Energy / WSU Energy Program / 2014 guide; glossary pp. vii-ix; application context in chapters 5-8
https://www.energy.gov/sites/default/files/2014/04/f15/amo_motors_handbook_web.pdf

ABB / 3AFE61389211 Rev C, 2011-05-12; printed pp. 13-16
https://library.e.abb.com/public/5212850908d44d979d34b61b703feeaa/ABB_Technical_guide_No_4_REVC.pdf

Educational reference, not a work procedure, diagnosis or qualification. Use current OEM/site requirements. Scope and full lessons: https://apexreng.com/library/component-lab/