# Energy-Efficient Motor Saving and Payback

Power, energy and cost saved by replacing a motor with a higher-efficiency one (IE2 to IE3 or IE4), and the simple payback on the extra cost.

**Method:** IEC 60034-30-1 (efficiency classes)

## Input parameters

Unit system: SI

| Parameter | Value | Unit |
|---|---|---|
| Motor rated output | 55.000 | kW |
| Load factor (shaft load / rating) | 75.000 | % |
| Efficiency of the existing motor at that load | 92.000 | % |
| Efficiency of the new motor at that load | 95.000 | % |
| Running hours per year | 8,000.0 | h |
| Energy price per kWh (your currency) | 8.0000 | |
| Extra cost of the new motor (your currency) | 150,000 | |

## Calculated results

| Parameter | Value | Unit |
|---|---|---|
| Input power saved | 1.4159 | kW |
| Energy saved per year | 11,327 | kWh |
| Cost saved per year | 90,618 | |
| Simple payback (years) | 1.6553 | |

## Formula and method

$$\Delta P = P_r\, L \left(\frac{1}{\eta_1} - \frac{1}{\eta_2}\right) \qquad \Delta E = \Delta P t \qquad S = \Delta E\, c_e \qquad n = \frac{C}{S}$$

### Variables

| | | |
|---|---|---|
| $P_r$ | rated output | W |
| $L$ | load factor | – |
| $\eta_1$ | existing efficiency | – |
| $\eta_2$ | new efficiency | – |
| $t$ | running hours per year | s |
| $c_e$ | energy price per kWh | currency |
| $C$ | extra cost | currency |
| $\Delta P$ | input power saved | W |
| $\Delta E$ | energy saved | J |
| $S$ | cost saved per year | currency |
| $n$ | simple payback | years |

### Method and standards

Input power is shaft power divided by efficiency; the saving is the difference at the same shaft load.

### Assumptions and limits

- Same shaft load before and after; no change in speed. Without a saving the payback is not shown.

### References

- IEC 60034-30-1 (efficiency classes)

## Report details

| | |
|---|---|
| Report reference | FCC-G8BH-31SD (the same inputs always give the same reference) |
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| Calculator | Energy-Efficient Motor Saving and Payback |
| Method last reviewed | 12 November 2026 |
| Software release | FireCAD Calc, release of 17 November 2026 |
| Release checks | 3 reference cases of this calculator, computed independently, are checked on every release |

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

### This calculator online

https://calc.firecad.com/electrical/motors/motor-efficiency-upgrade-saving

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.