Higher energy efficiency for more productivity and profitability

Use power efficiently
and reduce emissions

STÖBER

You can act now with a view to the future

The objective is the highly efficient drive axis

Energy efficiency in drive technology is the sum of small and large measures. As a rule the motor is the focus of the assessment.

STOBER already has products and components that are suitable for energy optimization concepts, as in practice it is often found that measures to promote energy efficiency coincide with the objectives of maximum customer benefit.

This closes the circle, investment in energy efficiency generally means investment in productivity and profitability.

In focus: efficiency increase on asynchronous motors

The subject of energy efficiency in drive technology concentrates on the optimization of the use of energy by asynchronous motors.

The STOBER asynchronous motors in the MGS geared motors qualify for efficiency class IE2.

As in general the motors are operated with a frequency inverter, in certain applications this configuration represents a further increase in the efficiency level.

Saving energy with constant speed drives

Drives with a constant operating speed do not need an inverter, if speed and torque can be defined using a gear unit.

The MGS asynchronous geared motor with its close range of gear set increments provides the perfect basis for this energy saving drive technology.

n_2	P_2	Example: MGS helical gear units																	
1/min	0.12	0.18	0.25	0.37	0.55	0.75	1.1	1.5	2.2	3,0	4,0	5,5	7,5	9,2	11,0	15,0	18,5	22,0	
5	229	344			1051	1433			4202										
6	191	287	398		875	1194			3502	4775		8754							
8	143	215	298		657	895	1313		2626	3581	4775	6566							
10	115	172	239	353	525	716	1051	1433	2101	2865	3820	5253	7163						Md_2 max
12,5	92	138	191	283	420	573	840	1146	1681	2292	3056	4202	5730	7029	8408	11460			
15	76	115	159	236	350	478	700	955	1401	1910	2547	3502	4775	5857	7003	9550	11778		
17,5	65	98	136	202	300	409	600	819	1201	1637	2183	3001	4093	5021	6003	8186	10096	12006	
20	57	86	119	177	263	358	525	716	1051	1433	1910	2626	3581	4393	5253	7163	8834	10505	
22,5	51	76	106	157	233	318	467	637	934	1273	1698	2334	3183	3905	4669	6367	7852	9338	
25	46	69	96	141	210	287	420	573	840	1146	1528	2101	2865	3514	4202	5730	7067	8404	
27,5	42	63	87	128	191	260	382	521	764	1042	1389	1910	2605	3195	3820	5209	6425	7640	
30	38	57	80	118	175	239	350	478	700	955	1273	1751	2388	2929	3502	4775	5889	7003	

Table from the MGS brochure.
The column on the left shows the close increments in the output speeds

Optimal energy efficiency and high profitability are no contradiction, if the costs are considered over the entire life cycle.

Servo motors form the basis for the highest efficiency

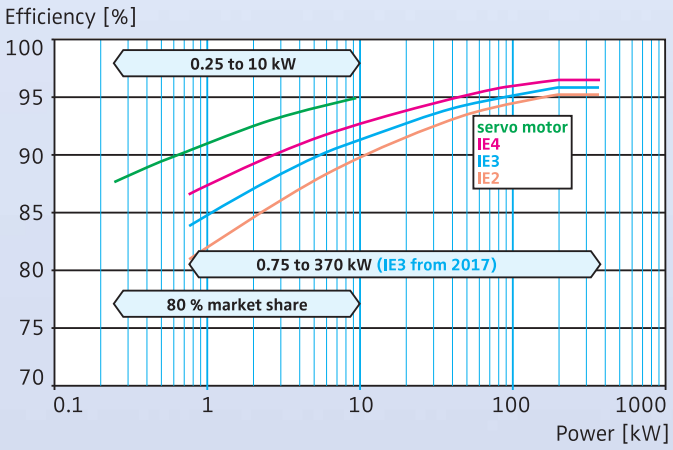
Asynchronous motors and permanent magnet servo synchronous motors in comparison

The comparison of asynchronous motors of class IE1 and permanent magnet synchronous servo motors in the power range up to 10 kW shows the dramatic difference between the two motor systems.

The result throws up the question as to how sensible it is, in terms of energy efficiency and the Eco-design directive, to continue to develop asynchronous motors for class IE2 and IE3.

For the demand up to 10 kW a tried and tested solution is available with the STOBER permanent magnet synchronous servo motors, which in addition require hardly any service.

The forward-looking alternative: SMS synchronous servo motors operate highly efficiently



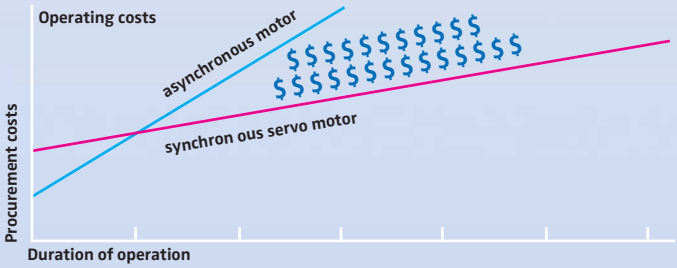
	MGS asynchronous motor IE2	SMS synchronous servo motor EZ **
Power range	0.55 to 9.0 kW	0.5 to 9.15 kW *
Efficiency*	80.5 to 89.6 %	82.3 to 96.5 %
Ø efficiency	84.8 %	91.82 %
Ø losses	**17 %**	**9 %**
Weight	14.5 to 92.0 kg	1.5 to 45.8 kg
Mass moment of inertia	21 to 350 kg·cm²	0.19 to 132.68 kg·cm²

* At 100 % load (size dependent)

** non-ventilated

STOBER MGS asynchronous motor

STOBER EZ synchronous servo motor

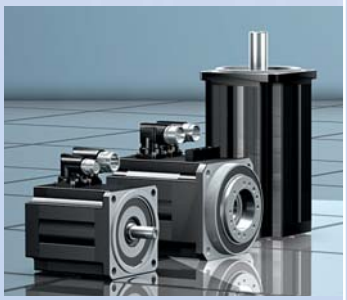


The procurement costs for asynchronous motors are approx. 60 % less than comparable permanent magnet synchronous servo motors. The additional cost of the servo motors can be recouped after only one year of operation due to their even greater energy efficiency.

Example: on a machine with four axes and a total power rating of 10 kW, permanent magnet servo motors save approx. 7 000 kWh of electricity per year in 2-shift operation. As a result 4.5 t of CO_2 are saved.

With their optional integral EnDat® or Hyperface feedback units, the high-efficiency EZ synchronous servo motors make it possible to supply just the actual power required for every drive situation without wastage.

With their low mass moment of inertia, EZ motors have comparatively low current consumption in dynamic applications.



STOBER EZ synchronous servo motor and EZF (with hollow shaft)

Super compact design with maximum power density

Powerful torque with dynamic performance that can be modified.

Variety of potential savings system-wide

Example: Performance-optimized synchronous servo geared motor

The SMS right angle servo geared motor is an exemplary energy optimized drive. The highly rigid and fully integrated design of the mechatronic components reduces the friction losses and as a result provides an efficiency of over 90 %. Combined with a matched drive controller, the result is a perfectly energy efficient, digital axis with high dynamic performance capable of continuous operation at a high speed.

SMS KS right-angle servo geared motor with POSIDYN® SDS 5000 servo inverter

Motors in regenerative mode produce energy

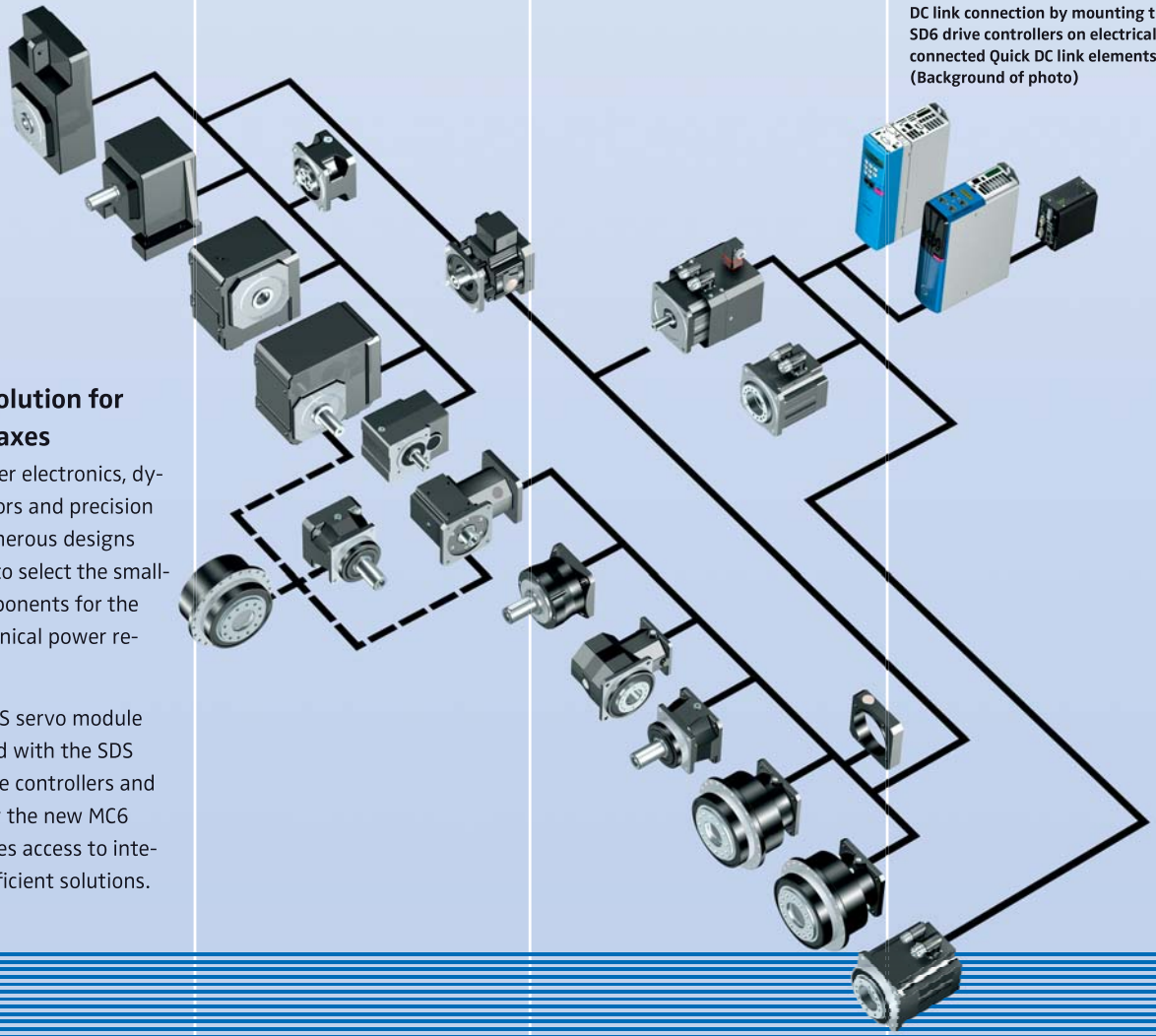
Regenerative energy is produced when a load drives the motor and delivers energy back to the drive controller. By DC link connection of several SD6 drive controllers, the regenerative energy produced by one servo drive can be used simultaneously by another. The use of a DC link connection should be seriously considered, particularly for operating conditions which change frequently (motor and generator operation).

DC link connection by mounting the SD6 drive controllers on electrically connected Quick DC link elements (Background of photo)

The system solution for digital servo axes

High quality power electronics, dynamic servo motors and precision gearboxes in numerous designs make it possible to select the smallest possible components for the maximum mechanical power required.

Therefore the SMS servo module system, combined with the SDS 5000 or SD6 drive controllers and supplemented by the new MC6 controller, provides access to integrated energy efficient solutions.



Better to reduce energy use than to buy more energy at high cost

Energy efficiency in industrial processes. The need for action in the coming years

The energy situation is characterized by the scarcity of fossil fuels, the climate change trend and the increasing energy procurement costs. In the past four decades the worldwide demand for primary energy has doubled. Rapidly growing economies have caused the flows of energy to take a new turn and resulted in a scarcity of supply with a corresponding effect on prices. The climatic and economic effects are having an impact on the regulatory situation at national and European level. After the initial focus of the policy on the construction sector and private households, the priority now is energy efficiency in industry. The energy requirement for electric motors is a central concern. The first objective involved moving motors to a new and higher efficiency class by compulsory standardization.

The EuP directive for electric motors

In the EuP directive (Energy-using Products directive) from the European Parliament and the Council of the European Union a framework for the usage of electric motors in the European Union is defined.

The current status:

Since 16.6.2011 the minimum efficiency level IE2 is binding for asynchronous motors.

From 1.1.2015 efficiency class IE3 will be compulsory for mains-operated motors in the range from 7.5 to 375 kW. As an alternatives IE2 motors are allowed, provided they are controlled using frequency converters.

From 1.1.2017 mains-operated motors over 0.75 kW will also be covered by this regulation.

Special motor versions are excluded.

(ZVEI) Potential savings in electric motors

Translation of an internet publication from the Innitiative Energie-Intelligenz, a campaign by the ZVEI (Zentralverband Elektrotechnik- und Elektronikindustrie e. V.):

. . . The greatest potential for energy saving in all drive tasks is slumbering in the electric motors, as more than 90 % of their total costs are due to their power consumption. By using energy-efficient motors the power consumption can be reduced by 5 % to 50 % – with very short payback periods.

This result is found for energy-saving motors in the (currently) highest efficiency level IE2 from as little as 2 000 operating hours a year. The potential for savings can also be further increased by the usage of drive systems with electrical speed regulation. With this technology the energy consumption can be reduced in total by a quarter.

www.en-q.de

(BMU) Potential savings in electric drives with frequency inverters

Translation of an internet publication by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety:

. . . If 35 percent of the electric motors in German industry were operated with speed regulation, 1.2 billion euro could be saved.

The use of frequency inverters is not worthwhile in systems which run mainly at full load, due to the power consumption by the speed controller. However, if the system mostly runs at partial load, these losses are quickly compensated by the saving.

Energy efficiency requires co-ordination and fine-tuning

Energy efficiency starts in the design

The basis for successful energy efficiency is the clarification of the exact requirement for mechanical power. During the design of the geared motor, an excessive 'safety margin' should not be applied.

If motors with over-dimensioned power reserves are used, they will continuously operate below their power rating. In the context of energy efficiency this situation is counter-productive. In addition to the low efficiency with unutilized power consumption there are higher procurement costs and possibly unnecessary problems with excessive weight.

STOBER experts would be pleased to advise you on the dimensioning of your drive axes. We are always available to give you further information.

Energy optimized processes

Motion control and axis regulation are to be included in a holistic energy efficiency assessment of a machine or automation system.

Specific knowledge of inverter functionality and software functionality as provided at STOBER seminars makes it possible to finely tune the axis control to exploit all the efficiency potential.

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