Energy Efficiency

Accionamientos eléctricos eficientes en la industria

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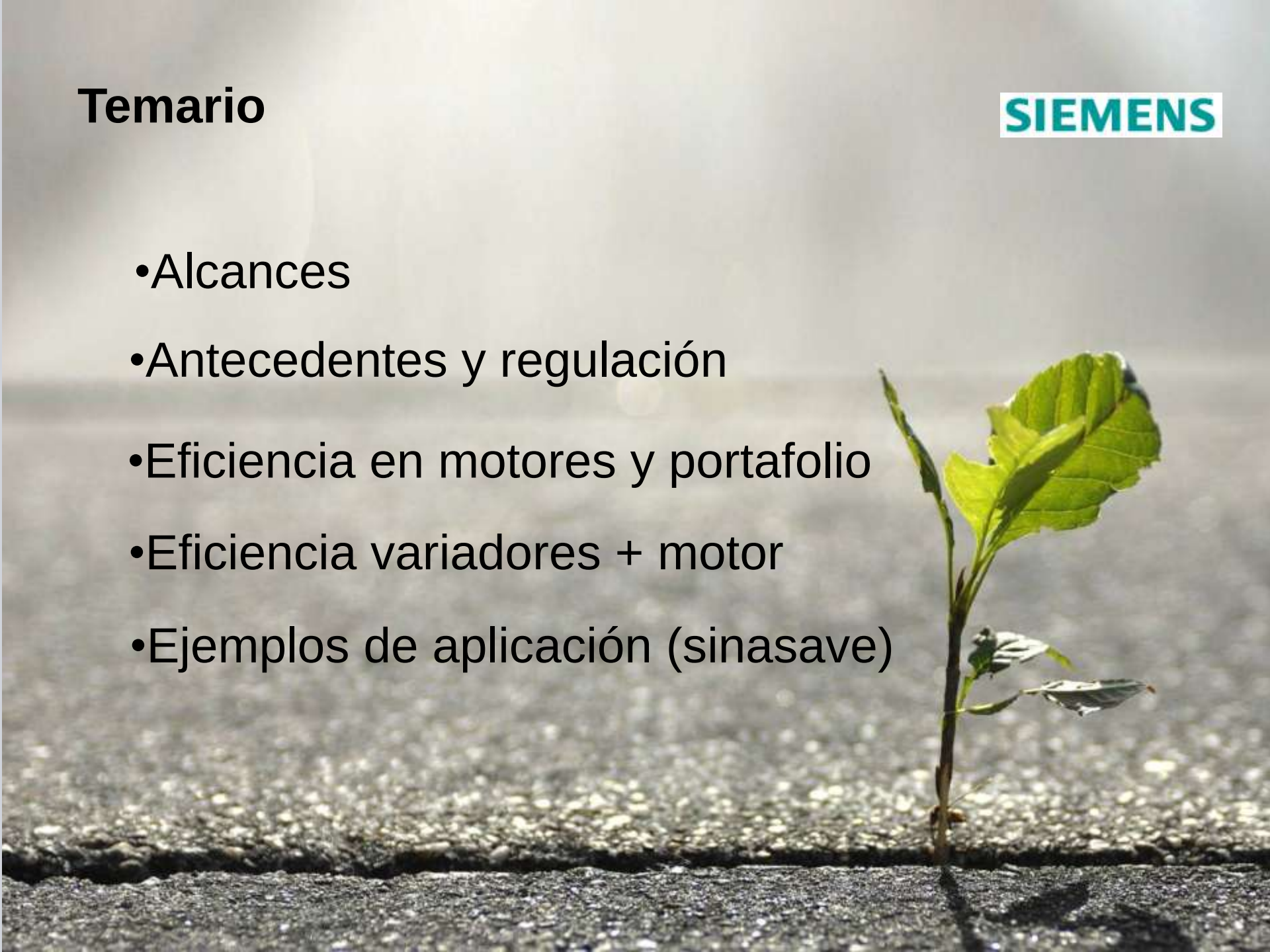
www.siemens.com/energysaving

Temario

- Alcances
- Antecedentes y regulación
- Eficiencia en motores y portafolio
- Eficiencia variadores + motor
- Ejemplos de aplicación (sinasave)



Energy Efficiency Reasons

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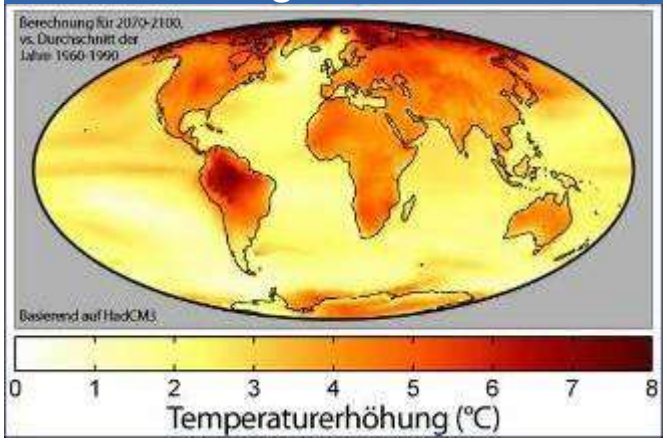
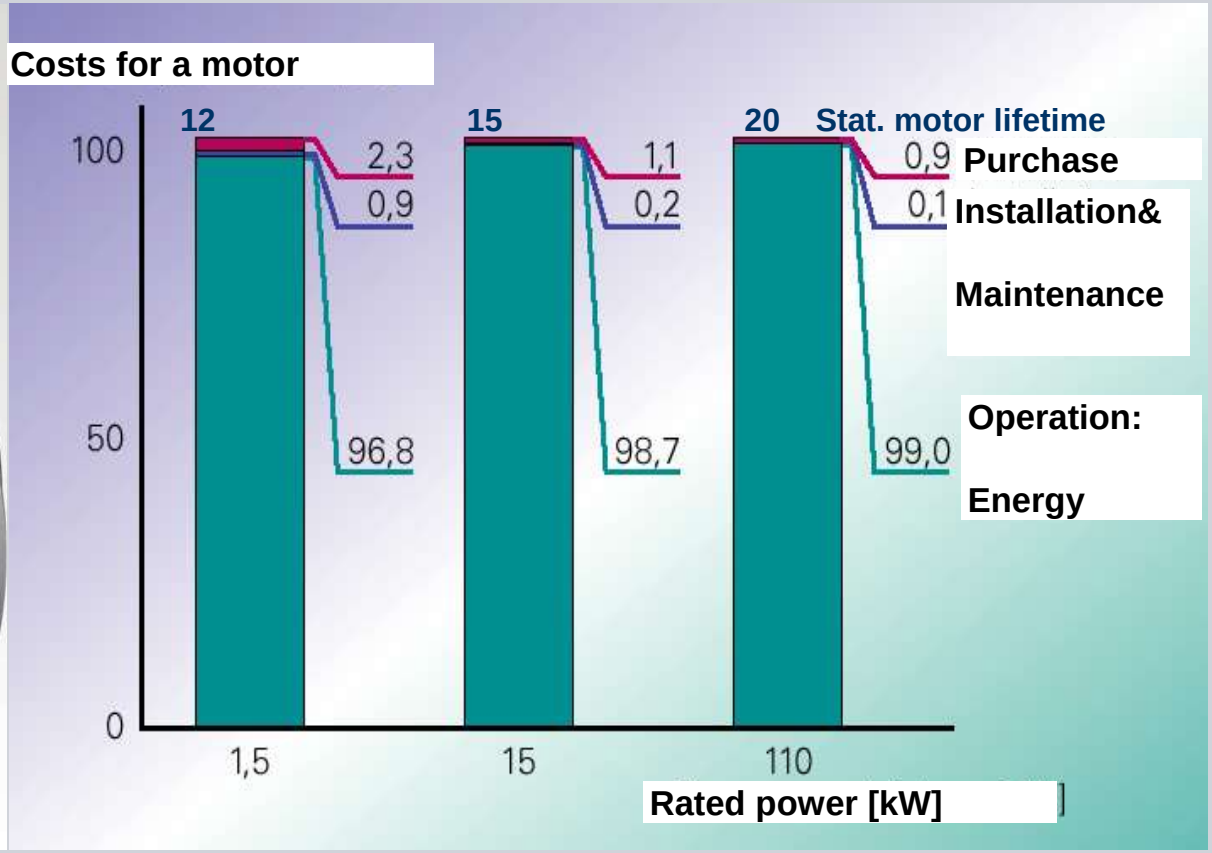
- Environment
- Prices / costs
- Legislation and standards
- Increasing energy costs
- Demand for a higher degree of productivity

Climate change



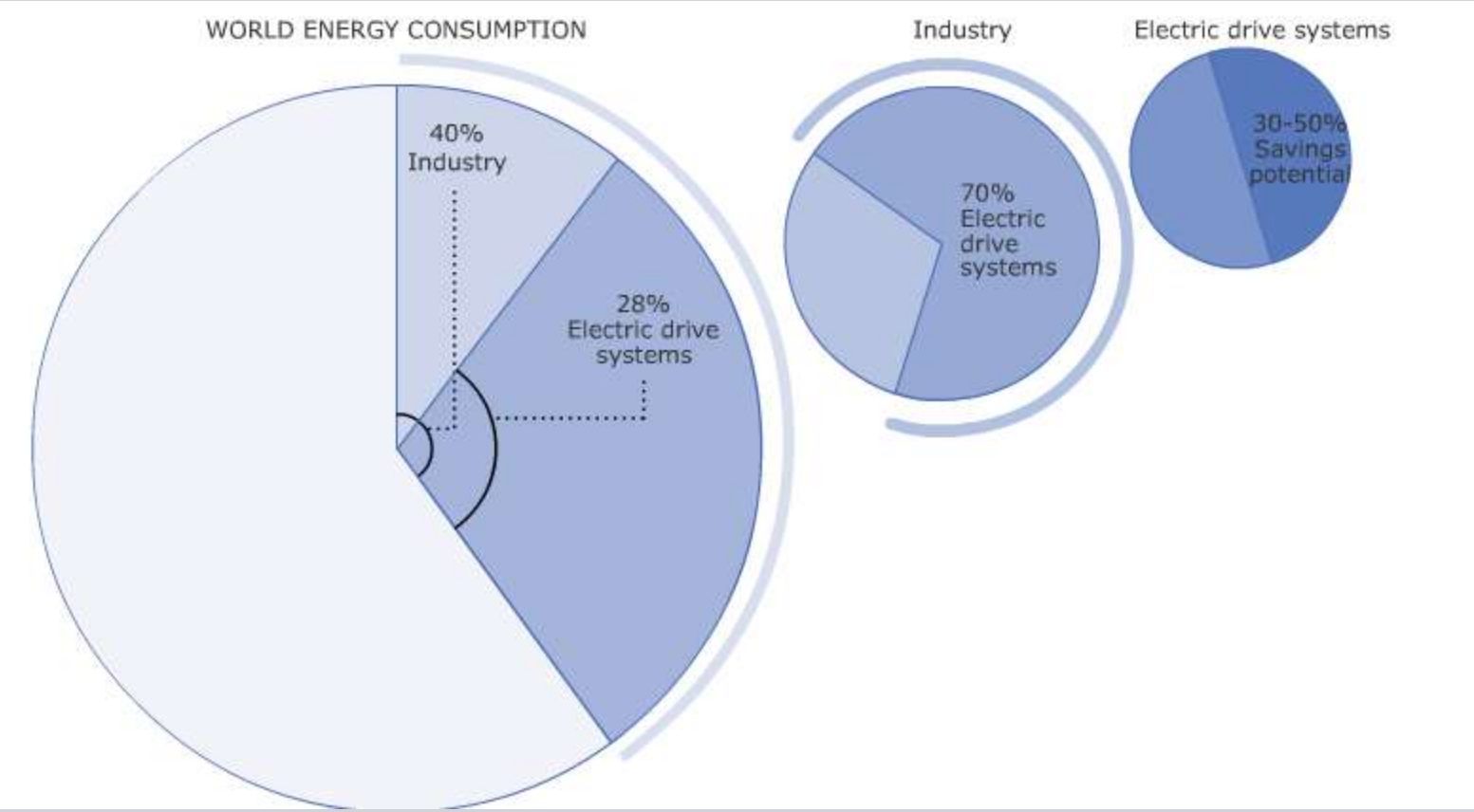
Energy Saving Cost Break-Down

The percentage of energy in the complete costs for a motor in operation is greater than 95%.



Source: Stat. motor lifetime DKI information brochure 09/99, Page 10

Energy Saving Potential



Electric drive systems represent approx. 70 % of industrial power consumption

Source: ZVEI 2006 / Siemens Large Drives 2010

Environment-friendly and cost-effective production by lowering the operating costs

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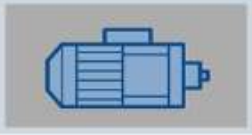
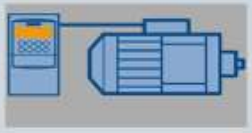
Electric drive systems represent approx. 70 % of industrial power consumption

Cost-saving possibilities through:		Avoids:	
	high efficient motors	4 ,0 Mio t CO_2	10 %
	efficient drives	12 ,0 Mio t CO_2	30 %
	mechanical system optimization	24,0 Mio t CO_2	60 %
	CO_2 savings 2000 - 2010	40,0 Mio t CO_2	

Source: ZVEI 2006

Percentage component of the total energy-saving potential

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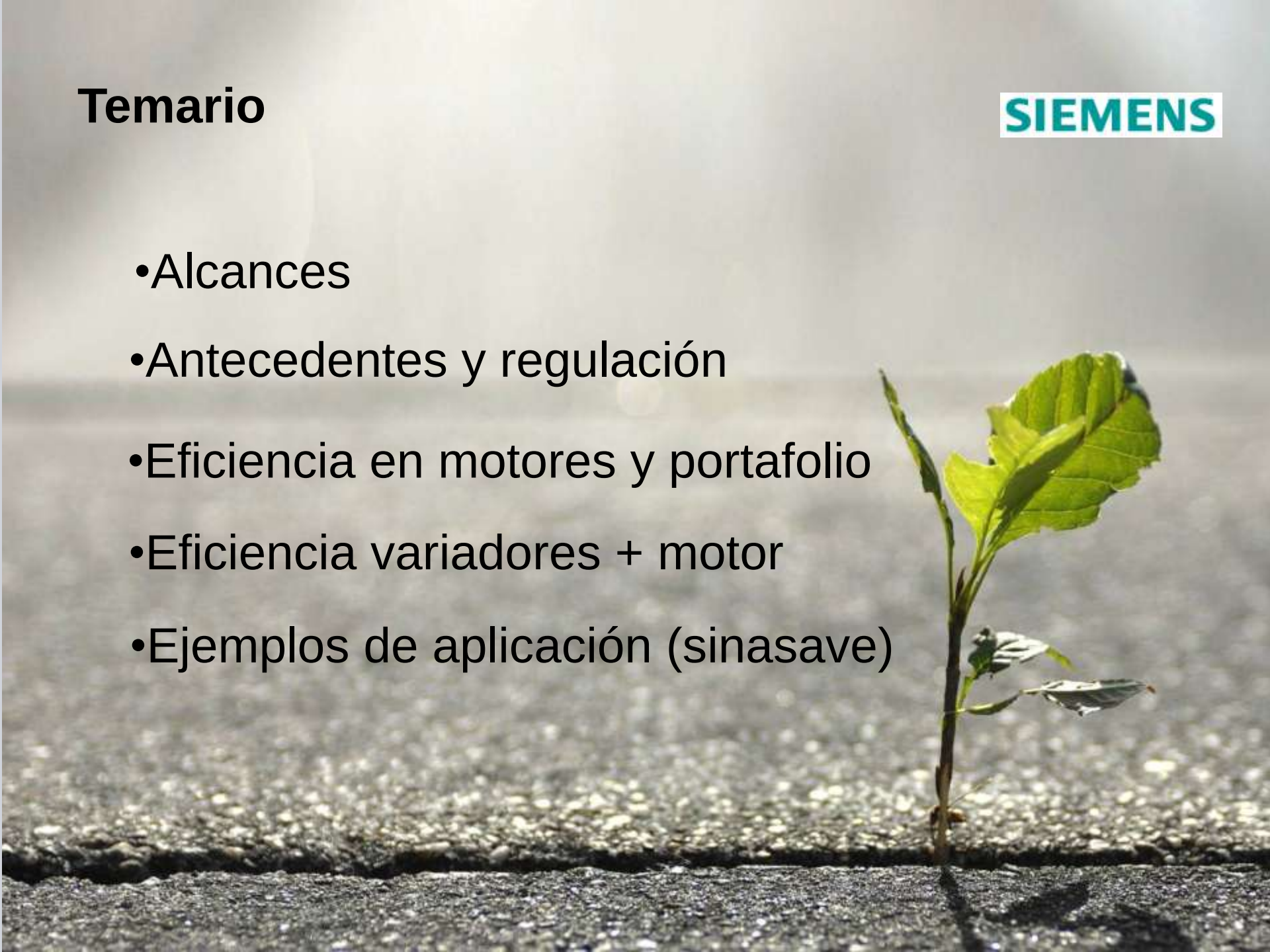

Efficiencies Initial Situation Worldwide

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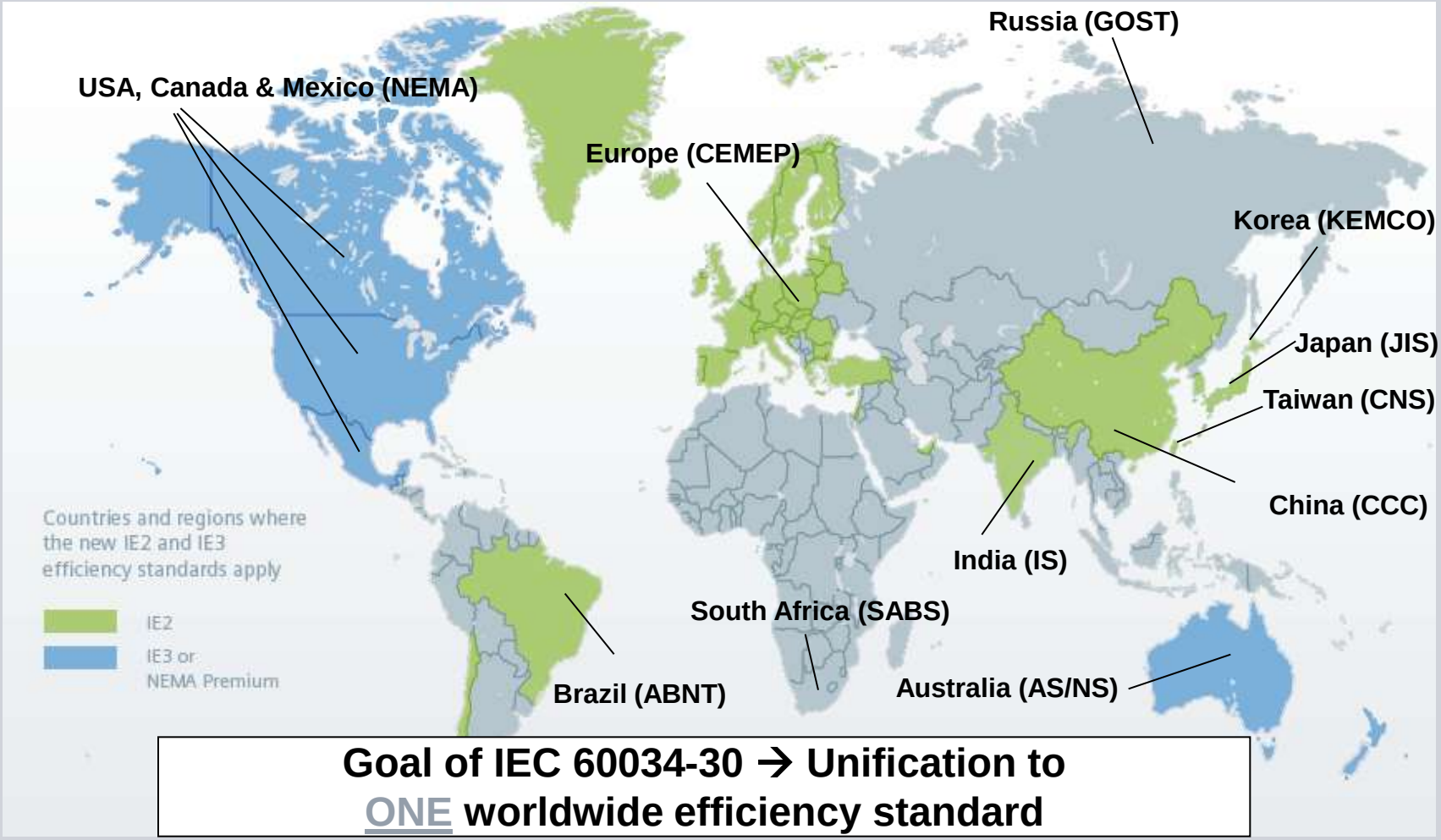

Goal of IEC 60034-30 → Unification to ONE worldwide efficiency standard

Which asynchronous motors are affected? – All changes at a glance

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	CEMEP Voluntary EU Agreement	EuP Directive Based on standard IEC 60034-30 (EuP Directive 07/2009 passed; EuP – Energy Using Products)
Description	Voluntary agreement between the EU Commission and the European Manufacturers Association CEMEP.	The EuP Directive must be implemented in domestic legislation in all EU countries. IEC 60034-2-1: 2007 is the basis for determining the losses and therefore the efficiency.
Number of poles	2, 4	2, 4, 6
Power range	1.1 – 90 kW	0.75 – 375 kW
Level	EFF3 - Standard EFF2 - Improved efficiency EFF1 - High efficiency	IE1 - Standard Efficiency IE2 - High Efficiency IE3 - Premium Efficiency **mandatory from 16.06.2011**
Voltage	400 V, 50 Hz	< 1000 V, 50/60 Hz
Degree of protection	IP5X	all
Motors with brake	no	no
Geared motors	no	yes
Ex motors	no	EuP Directive – NO Siemens stamps zone 2/21/22
Validity	Voluntary agreement; is withdrawn with the implementation of domestic legislation.	Standard IEC 60034-30, valid since October 2008, EuP Directive has already been passed, domestic legislation must be implemented at the latest by 16.06.2011. This means that manufacturers may no longer market IE1 motors in the European Union.

NEMA motors

The current energy legislation EPAct (Energy Policy Act) will be replaced effective 12.2010 by EISA (Energy Independence Security Act).

Currently, EPAct defines the minimum efficiency (IE2) for power ratings from 1 to 200 HP, 2/4/6-pole, voltages of 230 V and 460 V. A series of exceptions apply.

From 12.2010, EISA extends the legal minimum efficiency requirements and the following motors must fulfill the NEMA Premium Level (IE3):

- 1-200 HP
- 2/4/6 pole
- 230 V, 460 V

Further, for instance, the following motors must comply with the NEMA Energy Efficient Level (IE2):

- 201-500 HP
- 2/4/6 and **8 pole**
- All voltages < 600 V with the exception of 230 V and 460 V
- Footless motors (IM B5)
- NEMA Design C (increased starting torque)

For details, refer to NEMA MG1, Table 12-11.

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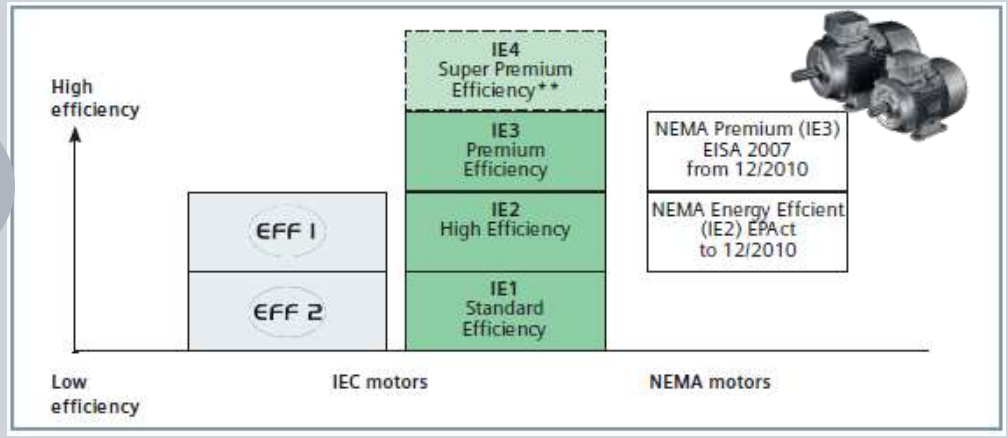
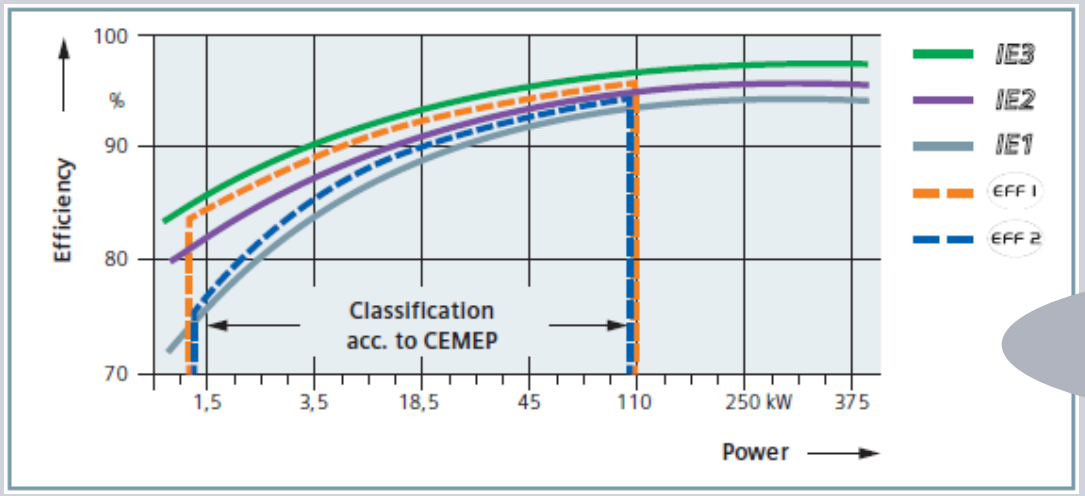
New Efficiency Standards in Europe and USA

New efficiencies in Europe & USA do have an major impact on the motor world →



IE1-IE3 efficiencies, 4-pole 50 Hz



← comparison EFF vs. IE

Eficiencia **Energética en Chile**

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En Chile, la Superintendencia de Electricidad y Combustibles estableció, a través de la Resolución Exenta N° 204112, la obligatoriedad de adoptar a partir del 4 de enero de 2010 los Protocolos PE N° 7/01 y PE N° 7/01/02 en el área de Seguridad y en el área de Eficiencia de Motores Trifásicos de Inducción Jaula de Ardilla, respectivamente.

Alcance:

- Motores de inducción (con rotor de jaula) trifásico que:
- 2, 4 y 6 polos
- Frecuencia de 50 Hz
- BT, marcados como 380/400/420/440/460/690 Volts
- Potencia nominal entre 0,75 kW y 7,5 kW
- Ciclo de servicio : S1(de acuerdo a la clasificación de la norma IEC 60034-1)
- Tipo de envolvente : Abierta o cerrada (> IP 21) con autoventilación

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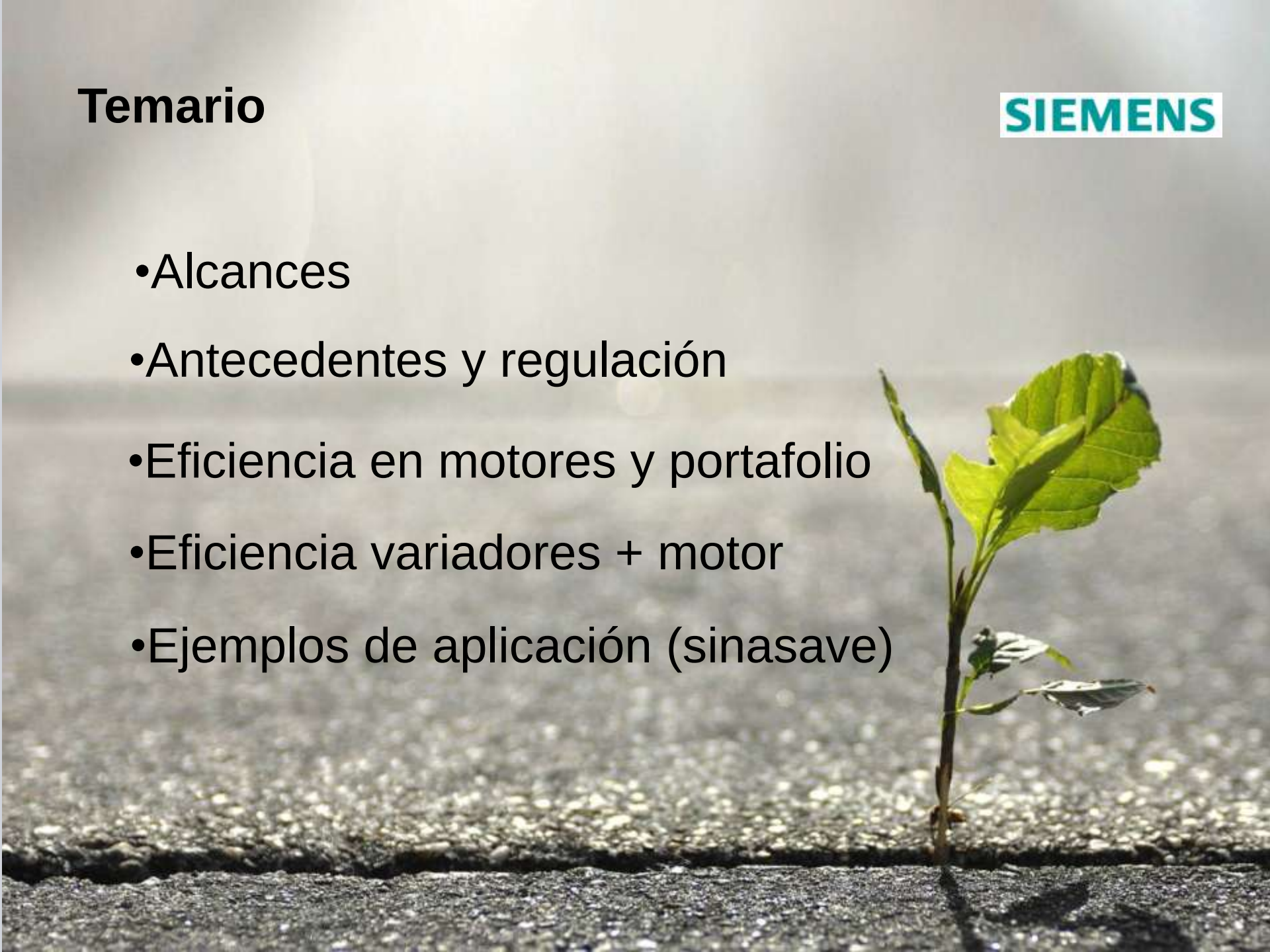

Energy Saving in Drive Technology

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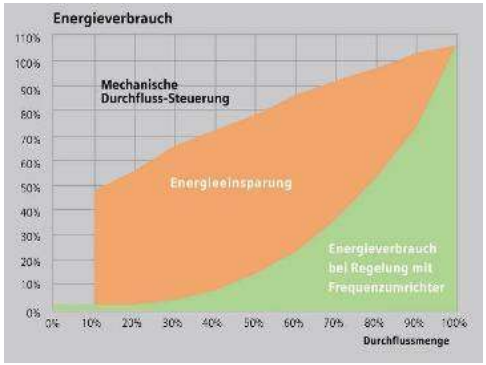
Beneficios para el usuario

Una inversión en eficiencia energetica tiene un retorno de inversión menor a dos años.

- Accionamientos Eléctricos
- Motores IE3
- Aplicaciones de ventiladores, compresores y bombas.



Aplicaciones en la industria

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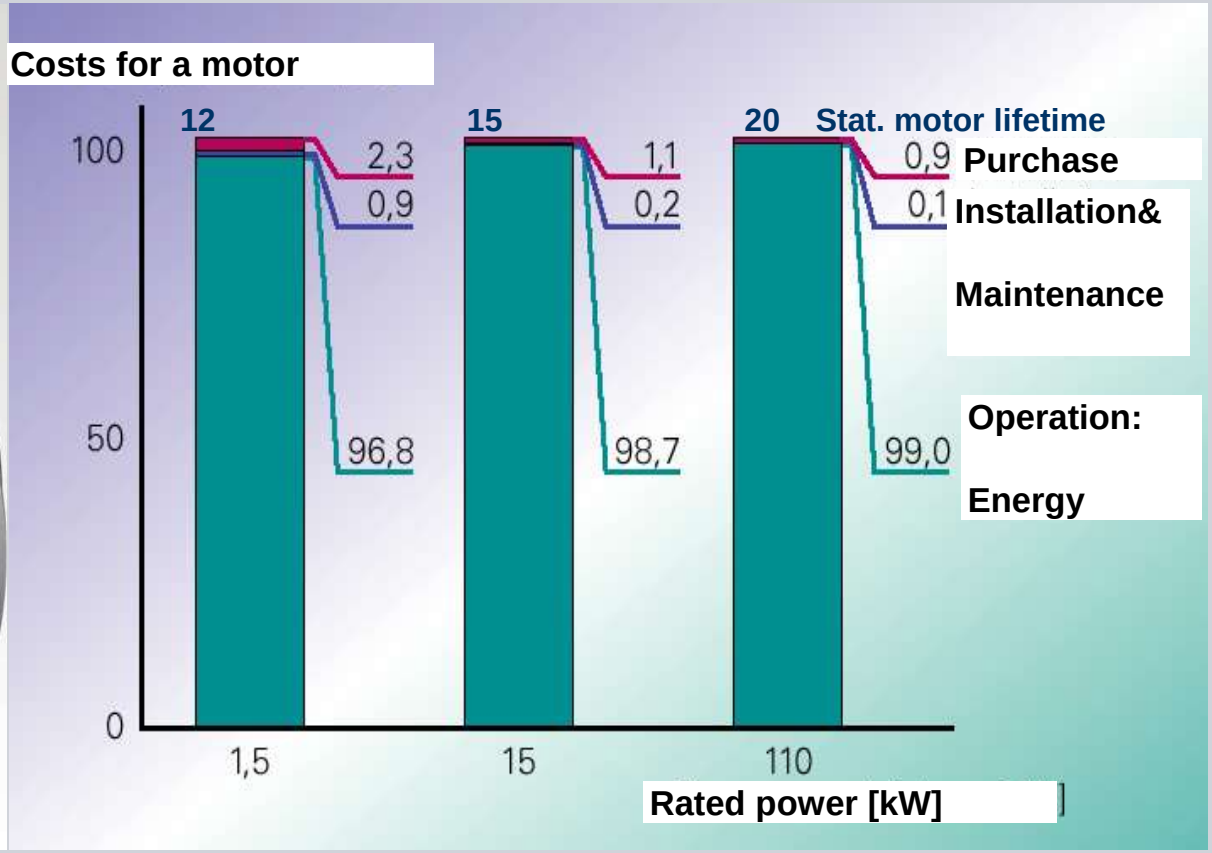
The percentage of energy in the complete costs for a motor in operation is greater than 95%.



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CONCEPTOS GENERALES
Eficiencia

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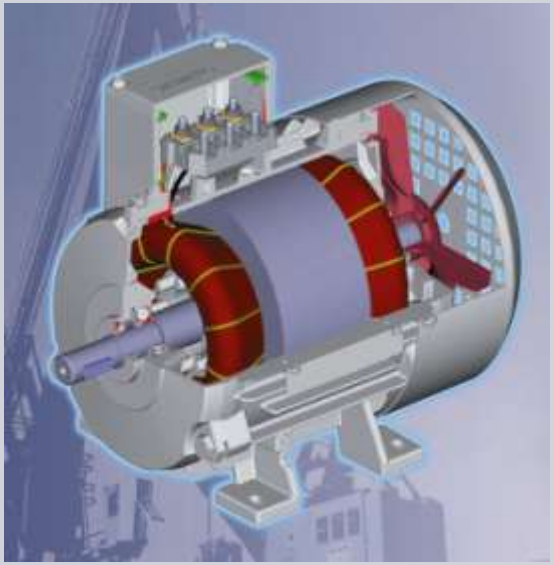

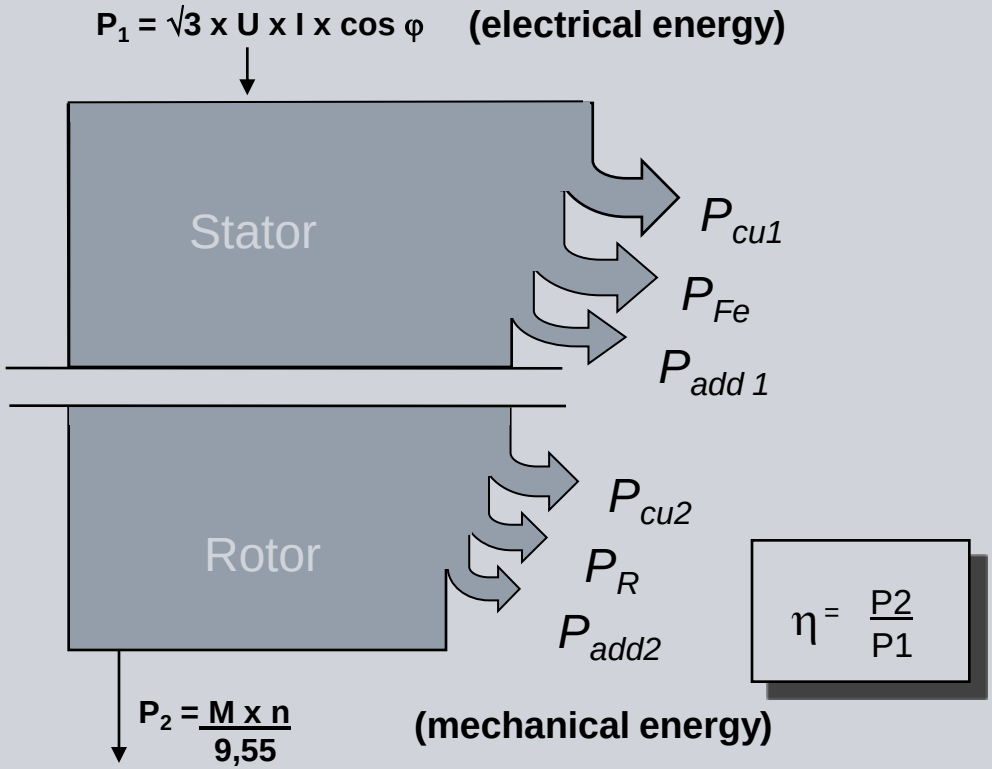

Losses are the difference between input and output power. Heat loss is dissipated via the enclosure

Motores IEC BT Siemens Alta Eficiencia

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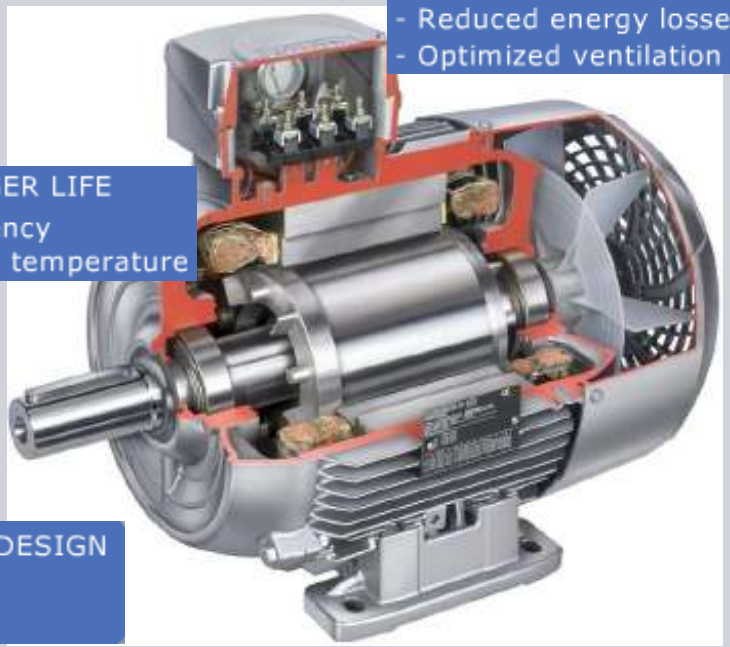
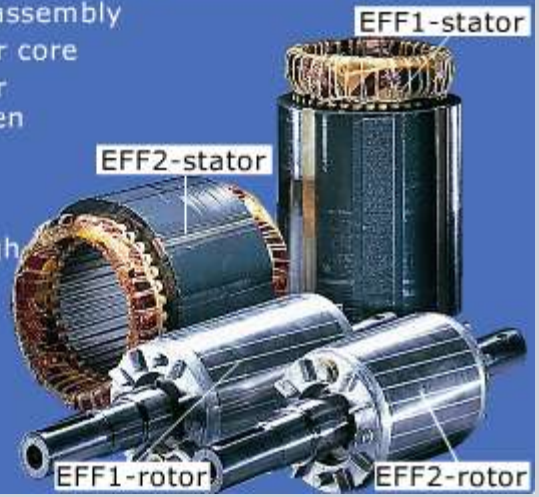
FAN: IMPROVED FAN
- Quieter operation
- Reduced energy losses
- Optimized ventilation system

BEARINGS: LONGER LIFE
- Improved efficiency
- Lower operating temperature



SHAFT: BETTER DESIGN
- Less slip
- Higher rpm

STATOR: HIGHER EFFICIENCY
- Windings with 20-60% more copper (active materials)
- Winding resistance reduced due to larger wire cross-section
- Higher quality steel laminations (active materials), reduced magnetic stress
- Larger core assembly
- Longer stator core
- Optimized air space between the stator & rotor
- Reduced losses through electrical resistance
- Increased motor efficiency
- Reduced heat losses



ROTOR: HIGH PRECESION BALANCING
- Less vibration
- Winding resistance reduced due to larger rotor slots(section geometry)

Motores IEC BT Siemens Alta Eficiencia

Los motores de alta eficiencia son de idénticas dimensiones que los motores de eficiencia incrementada, facilitando su intercambio.

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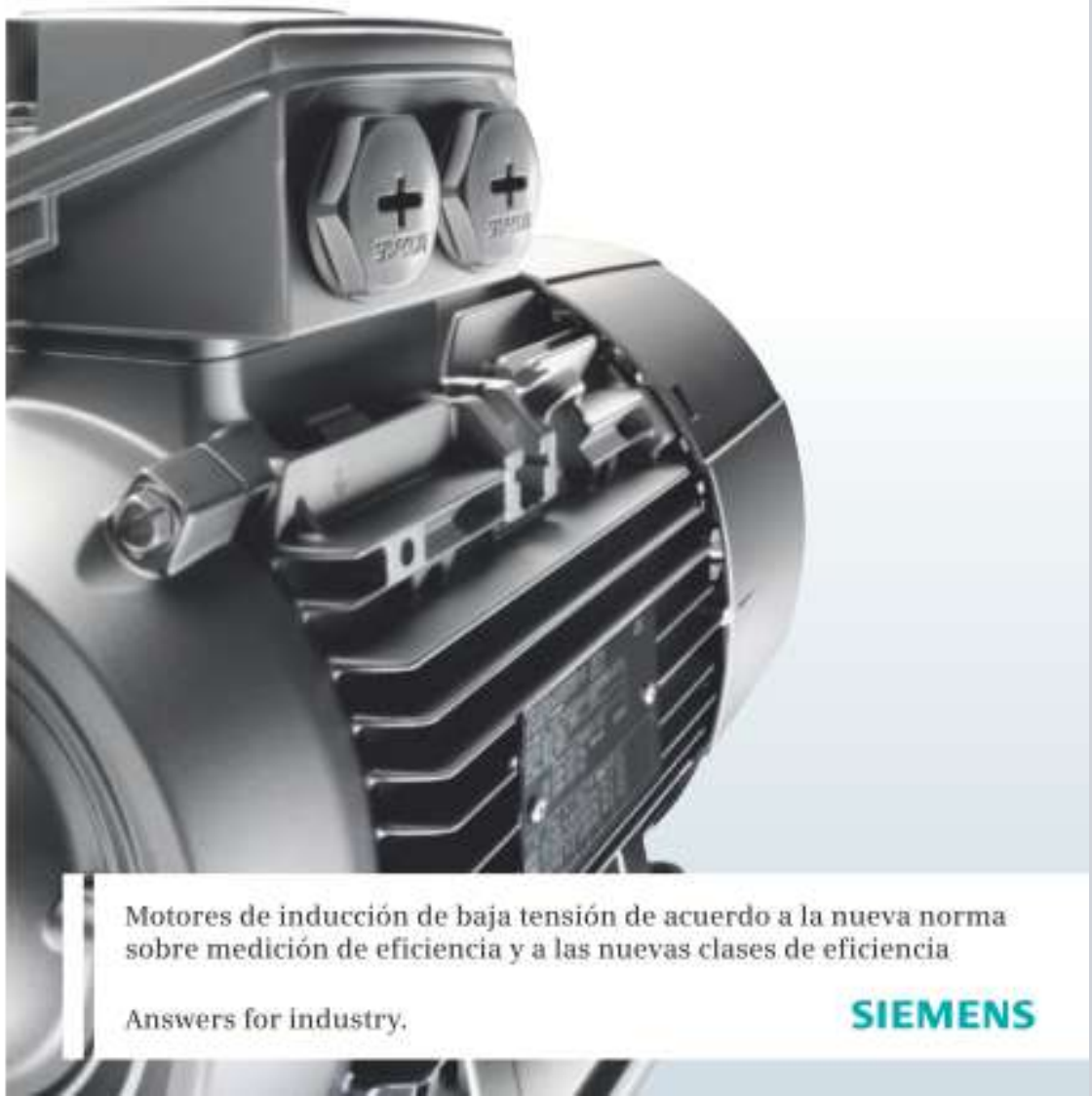

DUCASSE COMERCIAL

SARGENT

Lureye
Soluciones que dan Valor

Ingeniería y Servicios
Hochschild

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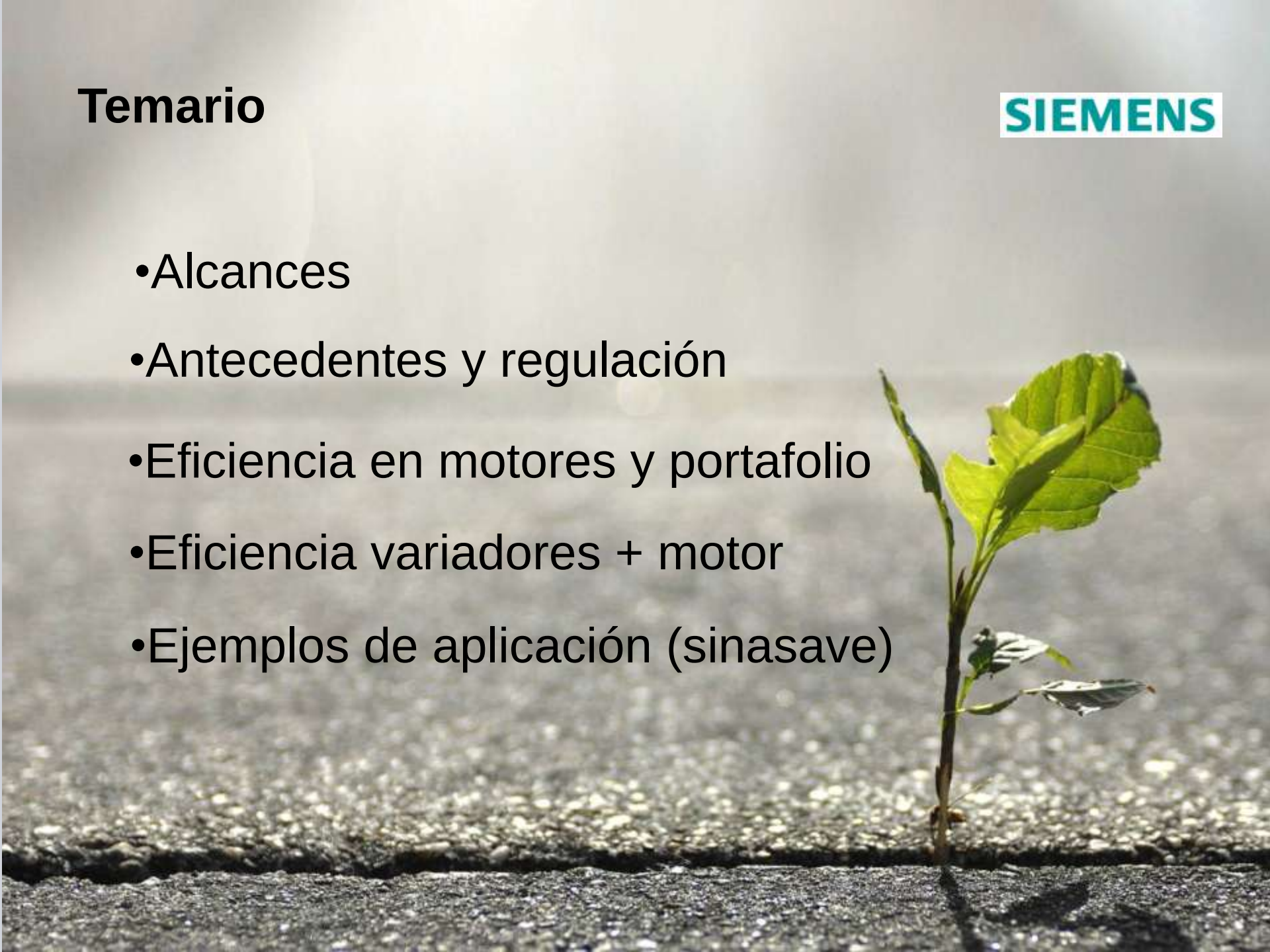

With converters and efficient motors
→ costs are reduced and processes improved

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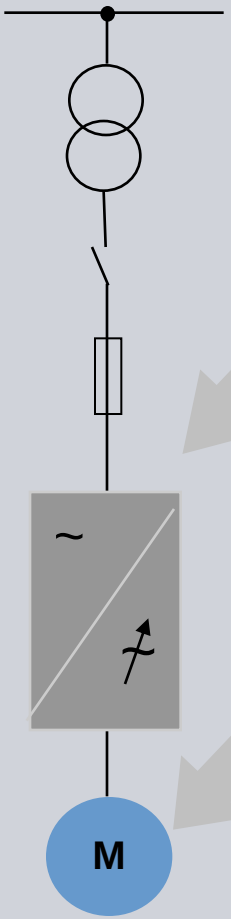


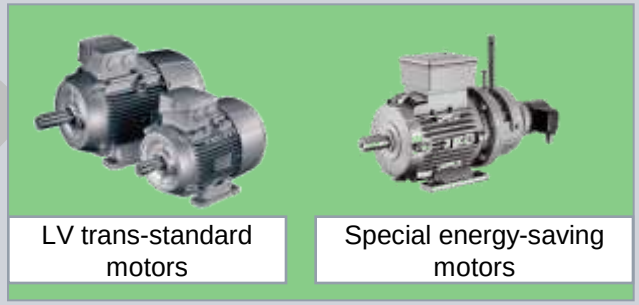
Converters

Low-voltage converters
MICROMASTER and SINAMICS

Medium-voltage converters
SINAMICS GM/SM, Perfect Harmony

Up to 70% energy cost saving for a payback time of < 2 years

Motors



LV trans-standard motors

Special energy-saving motors

LV torque motors
HT-direct

HV-motors H-compact, H-compact plus

Energy-saving motors from IE1 to IE3 with up to 10% higher efficiency than standard motors

Energy saving
Flow control using a throttle in a close system

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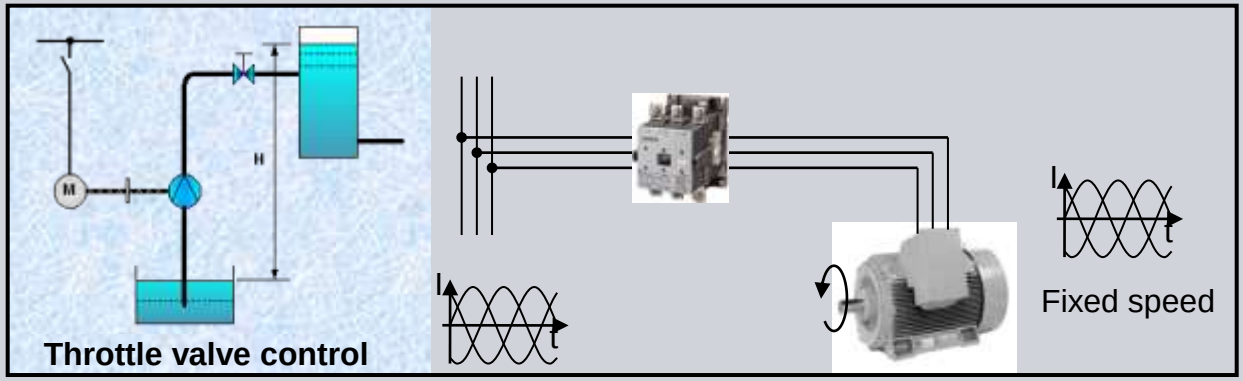
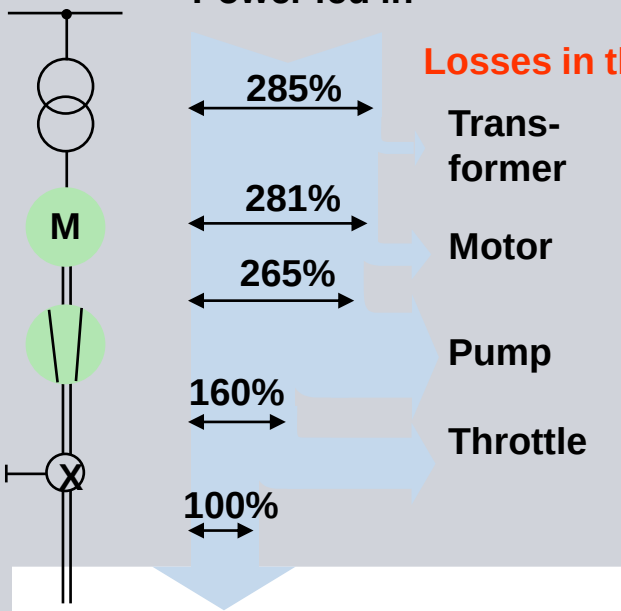


Operation, direct online



The drive process represents the main energy saving potential!

Example:

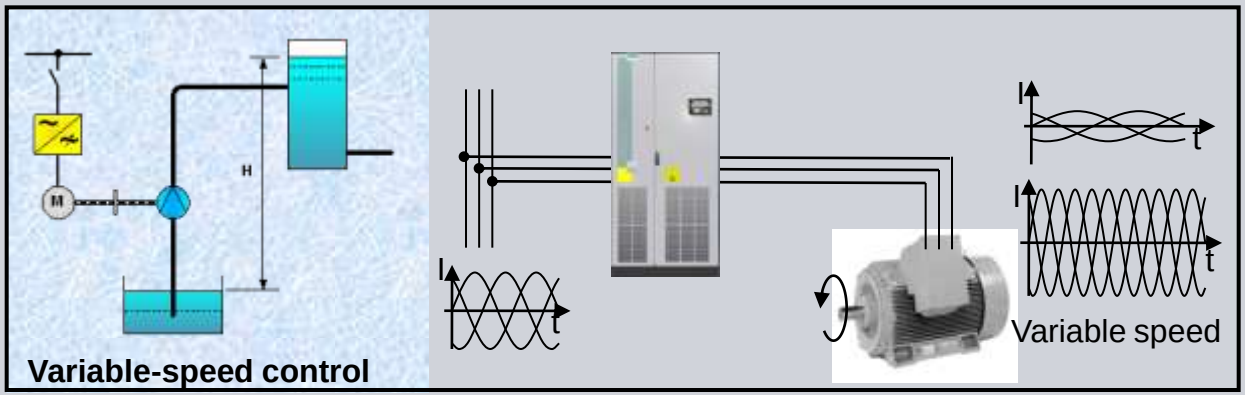
For a conventional fixed-speed drive with flow control using a throttle, 285 % of the power used is supplied in the form of electrical energy.

The energy balance of a pump, operated at constant speed, becomes increasingly more unfavorable, the lower the quantity of medium to be pumped.

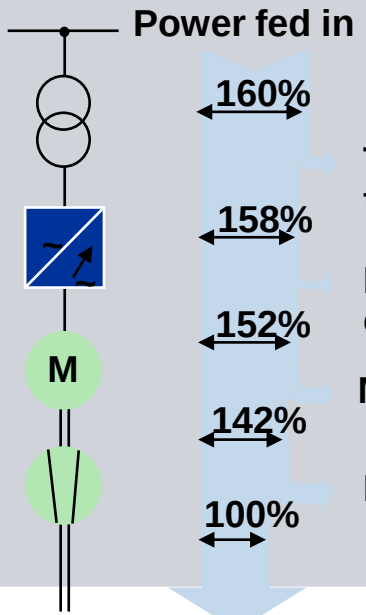
Energy saving
Flow control using speed control in a close system

SIEMENS

Energy saving



Operation from a drive converter



Power fed in

160%

Losses in the:

Trans-former

158%

Drive converter

152%

Motor

142%

Pump

100%

Useful (net) power

The drive process represents the main energy saving potential!
Example:
With electronic speed control, the power fed in is only 160% of the power required to pump the medium and the total losses are reduced to 1/3.

The process quality is also improved.

Nueva línea de motores 1LE1 (eficiencia IE3 - Video)

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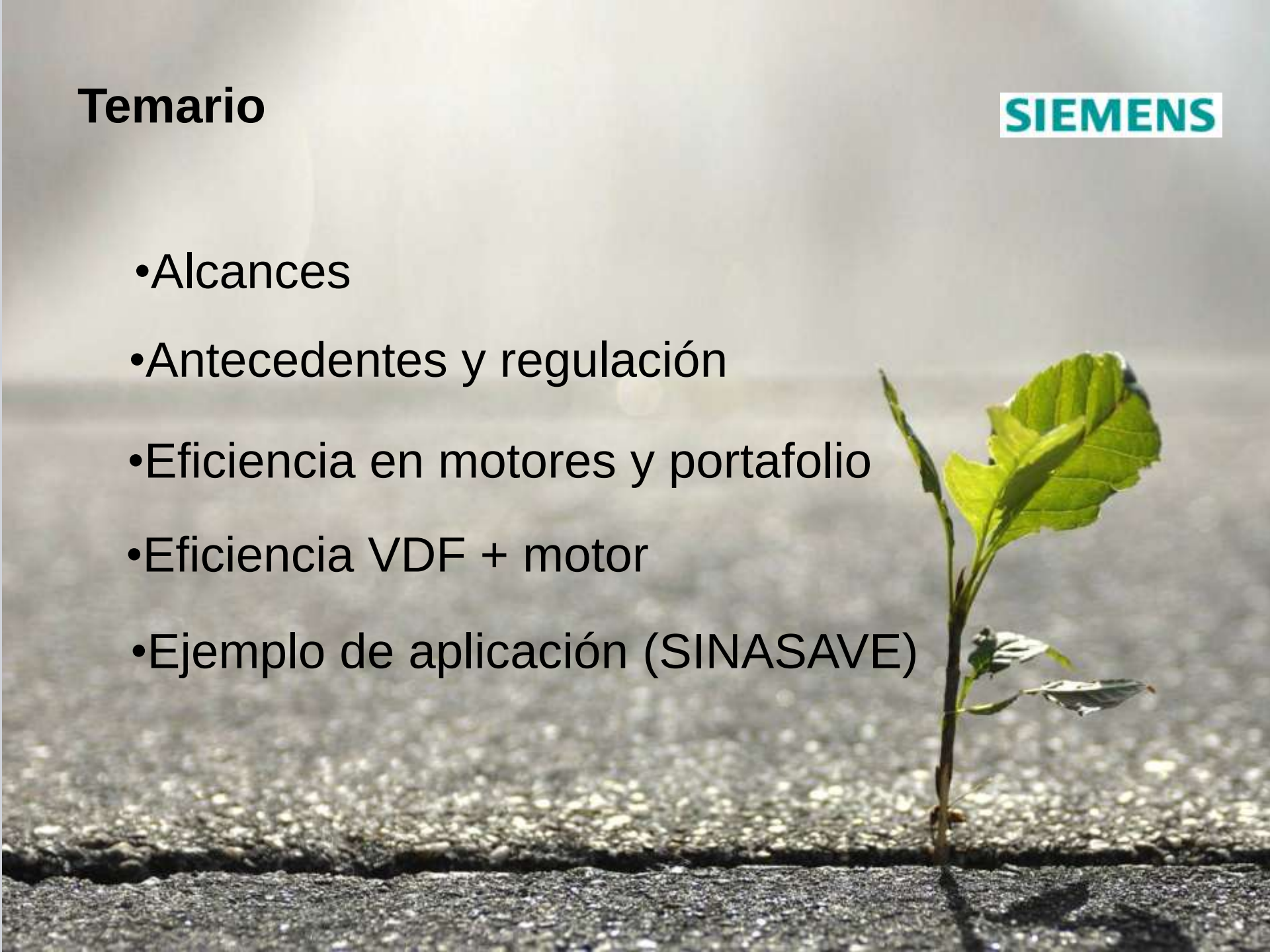

Calculating energy-saving in drive technology using SinaSave

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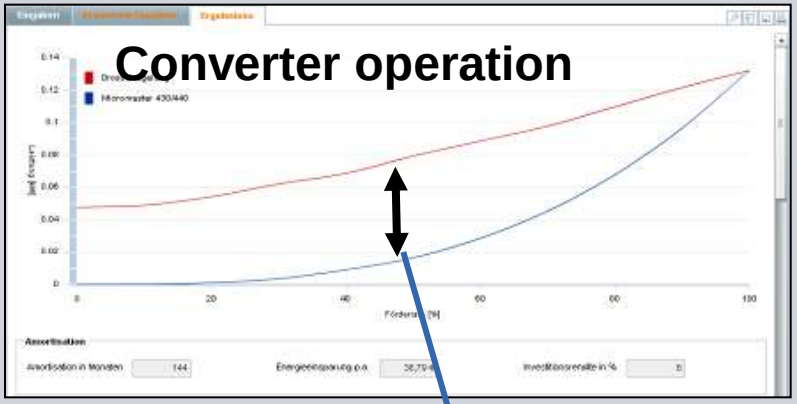

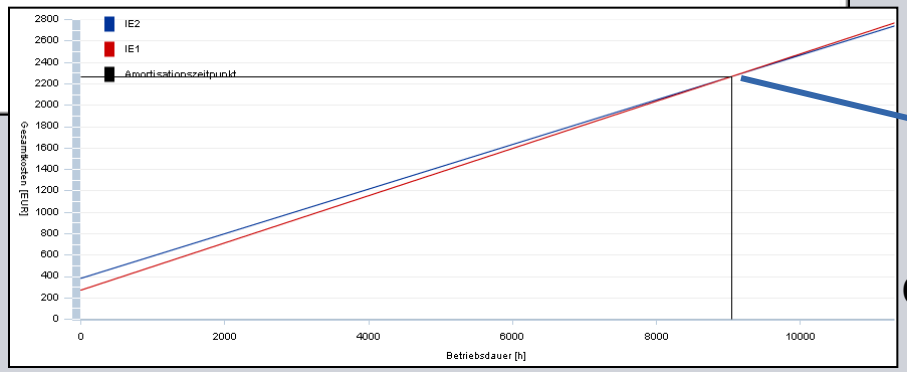

Breakeven point

Energy-saving potential

Can be downloaded at no charge under

www.siemens.com/sinasave

Ahorro Energético-Ejemplos

1er Caso: ¿Cuanto es el tiempo de amortización, en horas, de la adquisición de un motor eficiencia IE2 en comparación con un motor IE1? De acuerdo a los siguientes requerimientos:

- Potencia 15 kW
- Número de polos 4
- Motor de Aluminio
- Carga 100%
- Horas de operación por año
- Costo energía 0,155 USD/kWh

Datos a utilizar en SinaSave!!

Ahorro Energético-Ejemplos

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accionamiento de velocidad fija | accionamiento de vel. variable baja tensión | High Torque Direct Drives | accionamiento de vel. variable

inicio > motores de alta eficiencia IEC > IE2 contra IE1

Introducciones | Resultados

	1. IE2	2. IE1
Denominación del motor	1LE10011DB4.....	1LE10021DB4.....
potencia del motor en kW	15	15
Número de polos	4	4
Material de la carcasa	Aluminio	Aluminio
Carga del motor	4/4	4/4
Horas de funcionamiento p/año	turno (4000h)	turno (4000h)
Rendimiento en %	90,60	88,70
precio de la energía en USD / kWh	0,155 $	0,155 $
Consumo energético por año en kWh	66.225,17	67.643,74
costos de la energía por año en USD	10.264,90 $	10.484,78 $
descuento para el cliente en USD	4.023,46 $	3.218,77 $
Descuento para el cliente en %	52,60	52,60
precio al cliente en USD	1.907,12 $	1.525,70 $

consideración del sistema mecánico

solo motores de 4 polos

- ○ sí
- ◉ no

Cálculo de la amortización

número de motores	1	ahorro por año en kWh	1.418,58
tiempo de amortización en horas	6.938,78	Ahorro por año en USD	219,88 $

Ahorro Energético-Ejemplos

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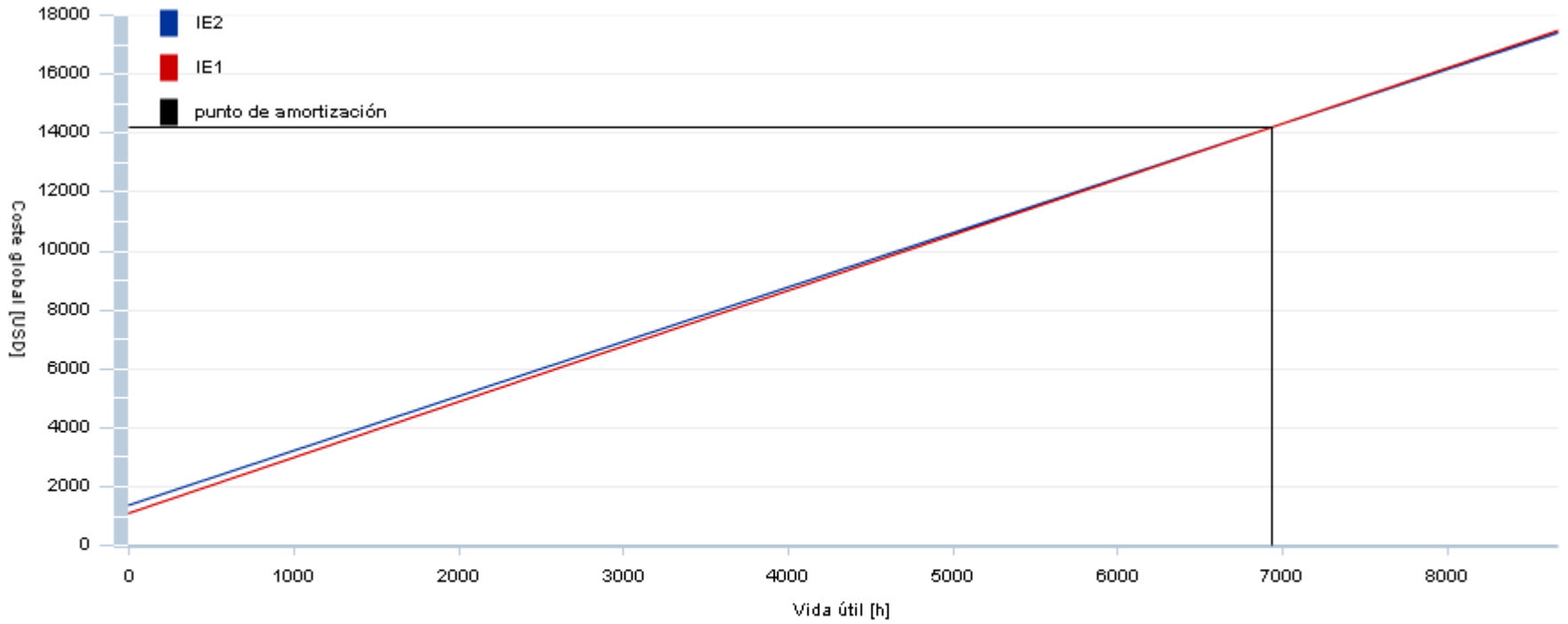
Introducciones | Resultados | consideración del sistema mecánico



Cálculo de la amortización

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tiempo de amortización en horas	6.938,78	Ahorro por año en USD	219,88 $

1,73

1 año y 9 meses

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