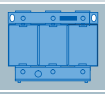
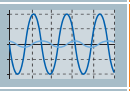
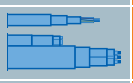
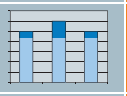
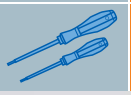
Efficient Infeed Technology

April 2008

Siemens is setting a unique global new standard for converters in the compact class: The technology is unrivaled worldwide and supports regenerative feedback capability in smaller, lighter and much more cost-effective devices.

The advantages of Efficient Infeed Technology over standard technology at a glance

	Standard Technology	Efficient Infeed Technology
Line reactor 	Required	Not required
Braking resistor 	Required	Not required
Configuration overhead 	Standard	Low
Generated harmonics 	Standard	Minimal
Heat generated when braking 	Yes	No
Power infeed 	Standard	Approx. 22% less
Power consumption 	Standard	Approx. 22% less
Energy efficiency 	Standard	Good
Reactive power compensation 	No	Yes
Installation outlay 	Standard	Low

Potential for savings in detail

Regenerative feedback/braking without resistor ➜ Energy savings

- 100% of the braking performance is fed back, whereby continuous braking is possible. In practice, this is not possible using braking resistors.
- No configuration of a braking resistor is necessary
- No need for installation, heat dissipation monitoring, etc. for external components

Minimal reactive power distortion ➜ Energy savings

- Power consumption is not “spiky”, but almost like a block, so a minimal transformer throughput rating is required, thus creating reduced reactive power distortion
- To achieve these harmonics with a standard converter, a reactor with $u_K = 6\%$ would be required
- Results in approx. 22% lower power consumption which corresponds to approximately 40% lower losses in the supply system
- Less load is placed on the power supply system

Reactive power compensation, improvement of the power factor cos phi ➜ Energy savings

- Response at input is slightly capacitive ~0.94
- Compensates the reactive power of motors and other inductive loads in the same supply system
- The current required by the overall system is reduced. In a system comprising a converter with a motor and an additional motor on the supply system, the total current will be reduced by up to 12%

Drive Technologies

www.siemens.com/sinamics-g120

SIEMENS

Efficient Infeed Technology

Application areas

Efficient Infeed Technology can be used, wherever a braking resistor is used today:

- Applications with vertical movements in general
- Drives for conveyor vehicles
- Machines with a high moment of inertia
- Centrifuges
- Renewable energies (water power, wind power)
- Applications with a high braking power over long periods

For the same power output, the input current for a converter with Efficient Infeed Technology amounts to approximately 80% of the input current for a standard converter.

Converters with Efficient Infeed Technology have a much lower harmonic content (and therefore lower reactive current component) than a standard converter. The relevant harmonics (up to the 11th harmonic) are less than half the value specified by the standard (EN 61000-3-12).

In what type of supply systems can converters with Efficient Infeed Technology be used?

The requirements on the supply system are no higher than those from the comparable standard frequency converters from Siemens or competitors.

Permissible ratio of short-circuit power of the supply system to converter apparent power:

$S_{K\_Supply} \geq 100 \; x \; S_{Converter}$ with $u_K \leq 1\ \%$

The benefits at a glance: saving costs, space and work

- Continuous braking with 100% of the rated power
- Energy savings thanks to regeneration with motor in generating mode
- Omission of braking resistor, line reactor and brake chopper
- No costly configuration of the braking resistors and no time-consuming cabling
- Considerably lower space requirements than conventional compact converters
- Up to 22% less power infeed
- No additional heat generated during braking

[1] For a total service life of 12,500 h, FEM 9.512 basis for calculation for stacker cranes

The following frequency converters are equipped with Efficient Infeed Technology

as option	SINAMICS G120 integrated in the PM250 power module
always with Efficient Infeed Technology	SINAMICS G120D SIMATIC ET 200S FC SIMATIC ET 200pro FC

Sample calculation for the hoist drive of a stacker crane

The following example shows the total cost calculation for a hoist drive of a stacker crane. A generally available compact converter without regenerative feedback is compared to a converter with Efficient Infeed Technology (e.g. SINAMICS G120 with PM250 and energy recovery). The configuration overhead and installation costs must still be considered separately. This results in additional savings in time and costs through Efficient Infeed Technology.

	Price example €	Space requirement (devices only) cm³
Standard technology		
Standard converter without PROFIBUS and encoder, without energy recovery, 22 kW high overload	2830,–	35035
Braking resistor (2 in series, 2 in parallel)	1480,–	80100
Line reactor	240,–	12155
Energy costs[1]	8850,–	–
Total	**13400,–**	**127290**
Efficient Infeed Technology		
SINAMICS G120 with PM250 and CU240E, with energy recovery, 22 kW high overload	3780,–	29610
Energy costs[1]	4220,–	–
Total	**8000,–**	**29610**
	40% Cost savings	77% Space savings

The SINAMICS infeed concepts

Basic Infeed	Standard infeed concept without regeneration
Smart Infeed	Infeed concept with regeneration for motion control applications
Efficient Infeed	Infeed concept with regeneration for standard applications with compact converters
Active Infeed	Infeed concept with active regeneration for motion control applications

Siemens AG
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