The heat of the moment

Save money with residential and small business heat pumps

Eskom

Get a heat pump and save

As a home owner, guest house/lodge operator or small business owner, reliable hot water is essential. The conventional electric element geyser consumes a considerable amount of electricity, which is becoming prohibitively expensive, prompting the move towards an alternate, simple, efficient and cost-effective method of water heating.

An option to consider is heat pump technology. Where the electric element geyser uses one unit of electrical energy to produce one unit of thermal energy, the heat pump converts one unit of electrical energy into approximately three units of thermal energy. That means a heat pump can potentially provide three times the thermal energy compared to an electrical geyser,

a saving of up to 67%

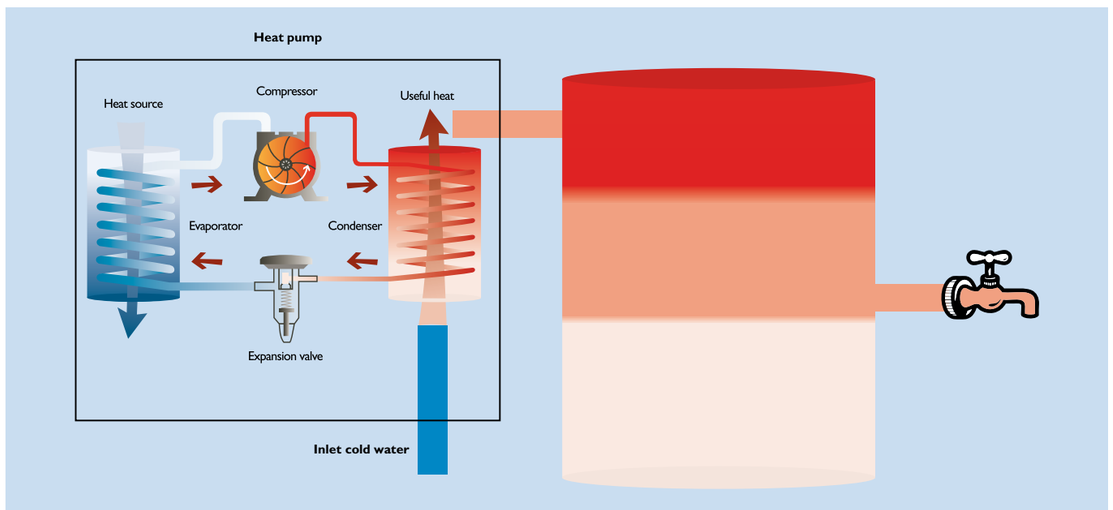
depending on the ambient temperature conditions, the installation in particular, and the use of a timer; this percentage efficiency will, therefore, vary per installation.

As an added incentive until March 2013, Eskom is offering a rebate on the purchase of heat pumps across the residential and small business sectors. This will assist you in significantly reducing your energy costs as well as reducing the demand for electricity nationwide, which is vital in the tightly constrained energy scenario in the country, presently and in the future.

How does a heat pump work?

Heat pumps use the reverse cycle of a refrigeration plant to heat water. In effect, it transfers heat from a source such as air or water to the water to be heated. As in other refrigeration equipment, the heat pump system employs an evaporator, a compressor, a condenser, refrigerant gas and an expansion valve inside a closed circuit. Latent heat is given off when the refrigerant gas is liquefied through the condenser, and transferred to the surrounding water together with further "sensible" heat loss, effectively raising the temperature of the water.

The diagram below illustrates how the heat pump uses a vapour compression refrigeration cycle in reverse with an evaporator air coil that acts as heat collector. The refrigerant gas is compressed in the compressor, intensifying or concentrating the heat. The low pressurised refrigerant returns to a liquid state and is pumped through the expansion valve. The refrigerant returns to the evaporator air coil to start the process again.



Types of configurations

Two types of configurations can be found in a typical domestic heat pump. In the case of the first type, an integrated system, the entire system is contained in a single unit consisting of a storage tank and a heat pump. In the case of the second type, a split system, the tank is separated from the heat pump. Heat pumps are typically mounted under the eaves on the outside walls of buildings or at ground level depending on the configuration of the system. It may be strange that an electro-mechanical device with moving parts – the electric motor driving the compressor – can heat water more efficiently than a typical resistance-element geyser. In fact, the heat pump can be up to three or four times more efficient than a hot water system powered by a normal resistance element because for every kWh of electricity supplied to the heat pump, more than three kWh of thermal energy in the form of hot water is produced. A thermostat keeps the hot water at a constant temperature with a 55°C to 60°C temperature range the most commonly used setting.

Note: In areas where water is considered hard, options that best suit those areas must be discussed with the suppliers to ensure optimal heat pump running and efficiency.

Who qualifies for the residential heat pump programme rebate?

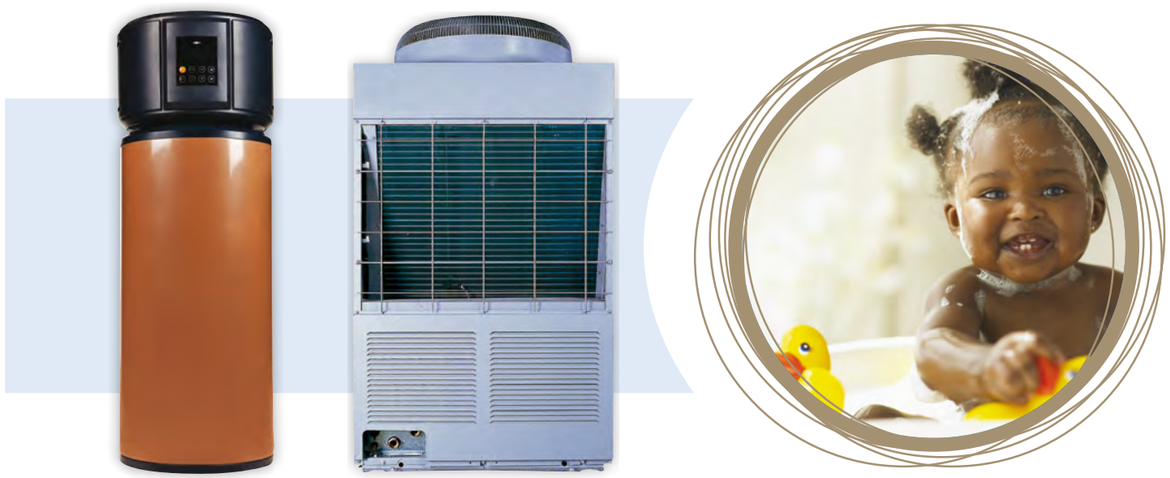
Residential home owners, guest house/lodge operators or small business owners, and even municipalities buying in bulk, are eligible for rebates on this programme. Rebates are only applicable in the case of units retrofitted on existing electrical element geysers with a capacity of between 100 litres and 500 litres.

Heat pump tank size	Rebates on offer
100 litres – 300 litres	Rebate = R3 668
301 litres – 500 litres	Rebate = R4 320

A heat pump purchased from an Eskom accredited supplier is sold at a price already discounted; in other words, you get the benefit of the rebate up front. The supplier submits the claim for the rebate to Eskom.

A heat pump or solar power?

Both technologies have benefits and should be regarded as complimentary. The choice between the two depends largely on the capital outlay, the projected savings and payback period, and your motivation for wanting to improve your method of water heating. Consulting both solar power and heat pump suppliers will assist you in this decision.



Approximate system payback period

The payback period for heat pump technology - when considering the rebate of R3 668 - is calculated at between 2 to 3 years based on a system cost of R15 000 and a kWh cost of R0.90/kWh. This calculation is, however, a guideline only since hot water usage, climate conditions, tariff structures and system cost can significantly influence and reduce the payback period. In today's terms, the indicated payback period can almost be halved as the cost of systems has reduced and energy costs have increased.

Approximate annual savings of heat pumps and environmental benefits

An average household - estimated to be spending R1 200 per month on their electricity account - is considered to be spending 40% on water heating. This amounts to R480 per month. A heat pump could save them up to 67% of that water heating cost depending on the conditions already mentioned, which amounts to R322 per month or approximately R3 859 per year. The estimated savings is R4 816 in year 2 and R6 059 in year 3.

	Electricity cost per month	Water heating is 40% of total electricity cost	Heat pump can save you up to 67% of this water heating cost per month	Estimated savings per year (rands)	Energy savings per month (kWh)	Energy savings per year (kWh)
Year one (assumed electricity tariff of R0.90/kWh)	R1 200	R480	R322	R3 859	357	4 288
Year two (based on an estimated electricity price increase of 24.8%)	R1 498	R599	R401	R4 816	357	4 288
Year three (based on an estimated electricity price increase of 25.8%)	R1 884	R754	R505	R6 059	357	4 288

The environmental benefits are impressive. A 150 litre heat pump unit will save 4 288 kWh of electricity per annum, resulting in the following annual environmental savings:

Annual environmental impact of a heat pump			
Item	Factors per kWh	KWh/annum	Total / Year
Water saved	1.35 litres	4 288	5,789 litres
Coal saved	0.55 kg	4 288	2,358 kg
Ash reduced	157 grams	4 288	673,216 grams
SO_2	7.75 grams	4 288	33,232 grams
NOX	4.18 grams	4 288	17,924 grams
CO_2	0.99 kg	4 288	4,245 kg
Source: Factors- Eskom Annual Report 2011, pg. 109.			

What may affect savings?

Savings percentages depend on individual installations and vary according to hot water usage and climatic conditions. System configuration, the length of pipes in the installation, the use of timers, storage capacity and the insulation material used, all affect heat losses and, therefore, savings figures. Heat pump payback periods vary depending on hot water usage, climatic conditions, the cost of systems and electricity price increases.

More information

For a list of Eskom registered heat pump suppliers, please access:
www.eskom.co.za/idm (click on heat pumps)
Call the Eskom IDM Customer Help Desk on 011 800 4744
E-mail heatpumps@eskom.co.za
www.heatpumpcentre.org

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