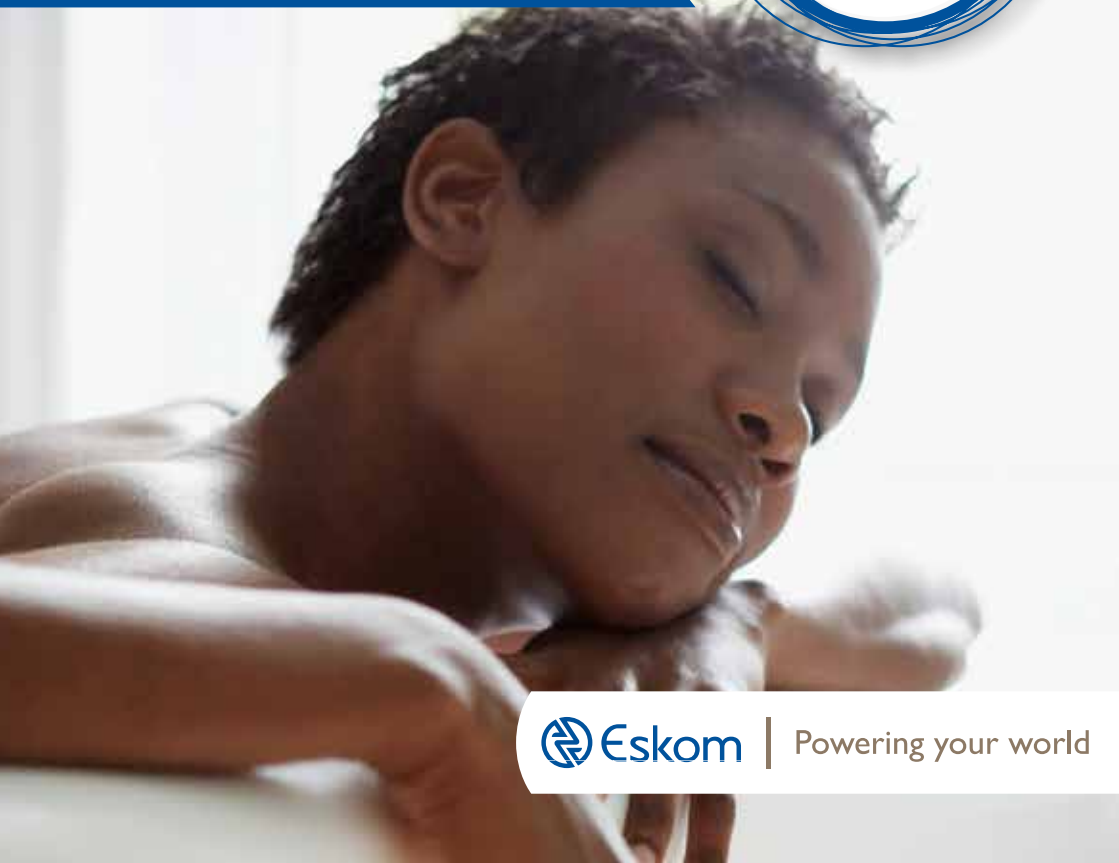
The heat of the moment

Save money with residential and small business heat pumps



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Get a heat pump and save

As a homeowner, guest house/lodge operator or small business owner, availability of 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.**

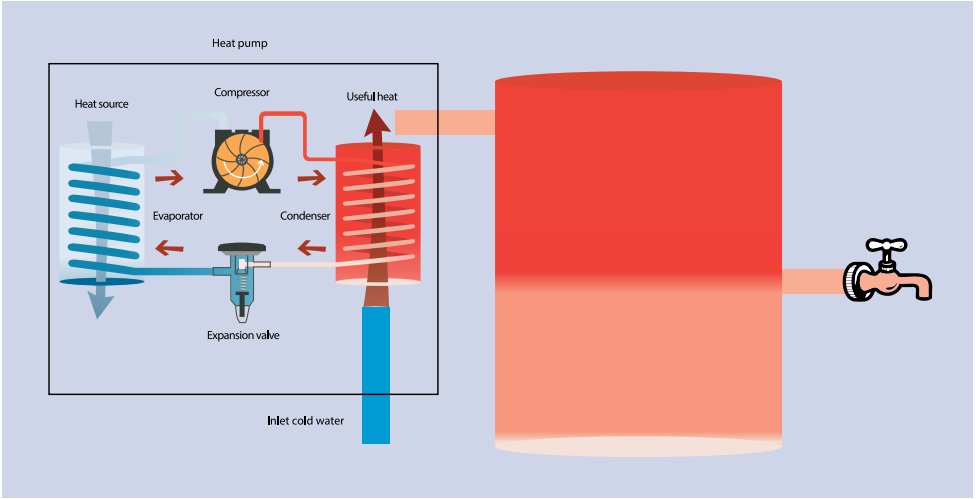
How does a heat pump work?

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 that needs 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 a 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

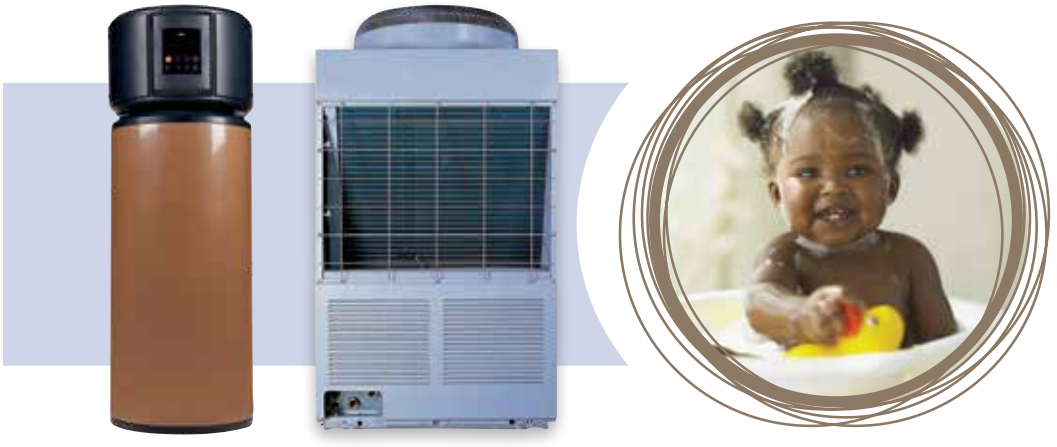


water more efficiently than a typical resistance-element geyser. In fact, the heat pump can be up to three or four times more efficient than a hot water system powered by a normal resistance element, because for every kWh of electricity supplied to the heat pump, more than 3kWh of thermal energy in the 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.

A heat pump or solar power?

Both technologies have benefits and should be regarded as complementary. 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 making this decision.



Approximate system payback period

The payback period for heat pump technology is calculated at between three and four years based on a system cost of R15,000 and a kWh cost of R1.00/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 approximately 40% on water heating. This amounts to R480 per month. A heat pump could save them up to two thirds of that water heating cost depending on the conditions already mentioned, which amounts to R321.60 per month or approximately R3,859.20 per year. The estimated savings is R4,167.94 in year two, R4,501.37 in year three and R4,861.48 in year four.

	Electricity cost per month	Water heating is approx. 40% of total electricity cost	Heat pump can save up to 2/3 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 R1.00/kWh)	R 1,200.00	R 480.00	R 321.60	R 3,859.20	321,6	3859,2
Year two (based on an estimated electricity price increase of 8%)**	R 1,296.00	R 518.40	R 347.33	R 4,167.94	321,6	3859,2
Year three (based on an estimated electricity price increase of 8%))**	R 1,399.68	R 559.87	R 375.11	R 4,501.37	321,6	3859,2
Year four (based on an estimated electricity price increase of 8%))**	R 1,511.65	R 604.66	R 403.10	R 4,861.48	321,6	3859,2

**Percentage increase based Multiyear Price Determination 3 approval

Annual environmental impact of a heat pump			
Item	Factors per kWh	kWh/annum	Total/year
Water saved	1,35L	3859,2	5287,104L
Coal saved	0,55kg	3859,2	2028,97kg
Ash reduced	157g	3859,2	598176g
SO_2	7,75g	3859,2	30680,64g
NOX	4,18g	3859,2	16170.048g
CO_2	0,99kg	3859,2	3820,608kg
Source: Eskom 2012 Annual Integrated report			

What can affect savings?

Saving 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 the systems and electricity price increases.

Where do I find energy efficiency information?

Go to **www.eskom.co.za/idm** or e-mail Eskom at **heatpumps@eskom.co.za**. Technical queries for companies in the industrial and commercial sectors can be directed to the Eskom Energy Services team on **08600 37566**.

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