

**JBL**

How to save energy in the aquarium

An aquarium (30-200 litres)
consumes much less energy than
you think! A 60 litre aquarium,
for example, consumes only slightly
more than the TV in standby mode!

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AHEAD THROUGH RESEARCH





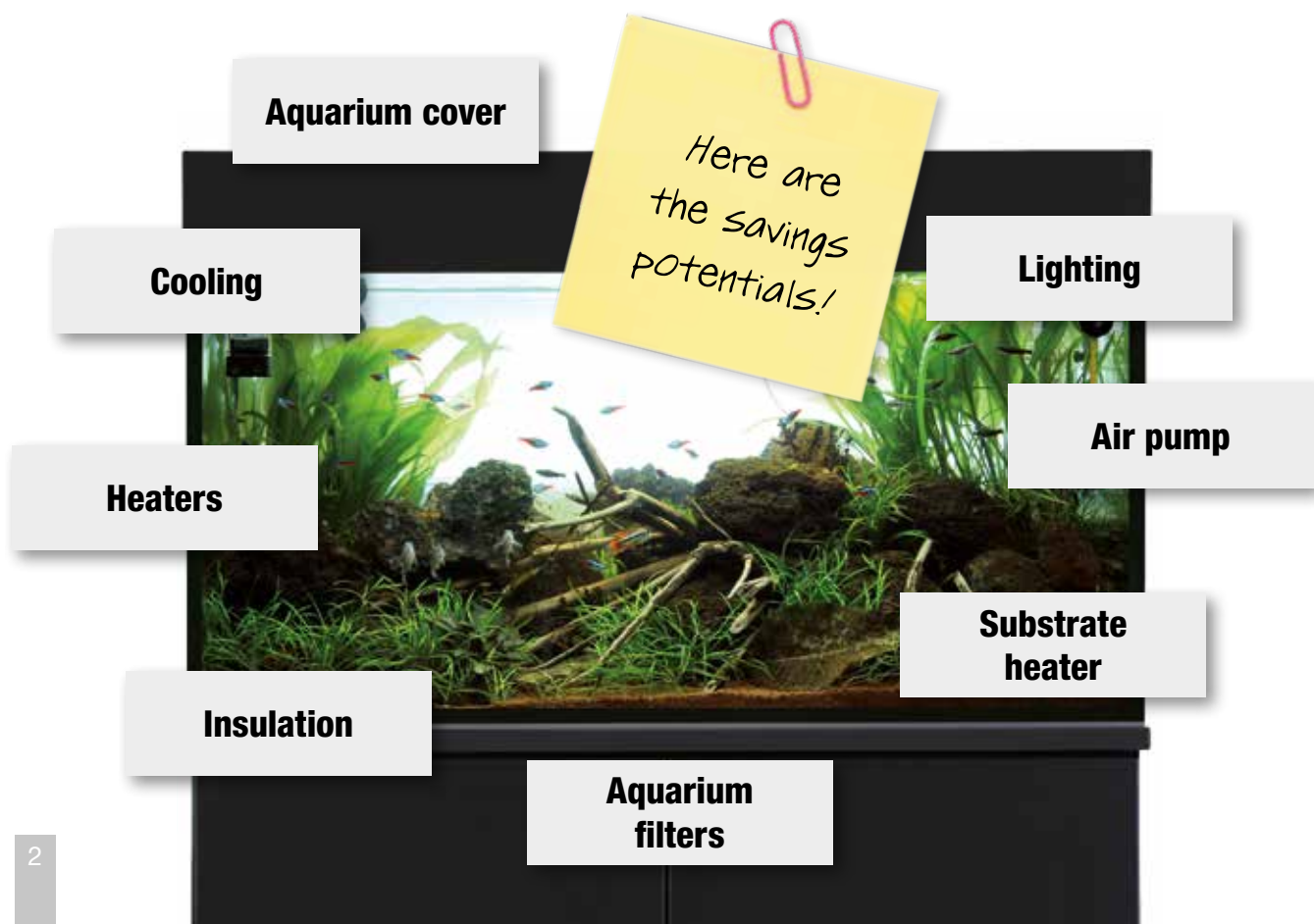
Here's how to
save energy
costs on your
aquarium!

In theory the highest wattage consumption comes from the heater thermostat, which the specifications give as 200 watts for a 200-litre aquarium. However, the thermostat is only supposed to keep the water temperature a few degrees above the room temperature. For much of the time, especially in the winter months, the temperature in the living room is around 22 °C. The heater then only has to raise the temperature by 3 °C to 25 °C and then maintain it. But how much electricity does it really consume? That is exactly what this chapter is about.

Before we begin: Anyone wanting to check how much electricity is being consumed in the whole aquarium can purchase an electricity meter. There are electricity meters available where you can enter the price you pay per kilowatt and find out how much you are actually paying, as well as how much wattage you are consuming!

If you don't have an electricity meter, you can easily calculate your electricity costs yourself using the following formula: calculation per year:

(watt x operating hour/1000 x 365) x € per KWh



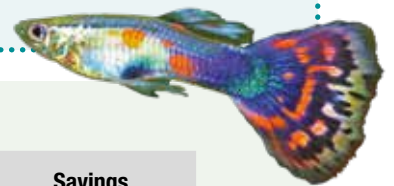
Here are
the savings
potentials!



Aquarium, 60 cm, 54 litres, at an electricity price of €0.40/kWh (= £0.34)

	Lighting	Filter	Heating
Product	JBL LED SOLAR NATUR	JBL CristalProfi i80	JBL PROTEMP s50
Watts	22	4	50
Running time	10 h/day	24 h/day	24 h/day
Temperature	-	-	set to 25 °C at room temperature 22 °C
Costs per month	€2,68	€1,17	€2,29
Costs per year	€32,12	€14,02	€27,45

The total electricity costs for this 60 cm example aquarium amount to €6.14 per month.
The same electricity costs are consumed by having your television on from 7 pm to 11 pm.



These measures will help you to easily reduce your energy consumption

Product	Measure	Cost	Savings
Heater thermostat	Reduce to 25 °C	0 €	++
Substrate heating	Switch off at night	0 €	++
Cooling	Remove cover	0 €	++
Lighting	Switch to LED	from 112 €	+++
Lighting	Reduce duration	0 €	+
Lighting	Use dimming	0 €	+
Cover	Put on/remove	0 €	+++
Insulation	Under and around the aquarium	from 4 €	+
Filter	Use energy-saving JBL filters	from 41 €	++
Air pump	Check necessity	0 €	+



JBL's LED light bars (JBL LED SOLAR NATUR and JBL LED SOLAR EFFECT) can be placed directly on the edge of the aquarium with the mounting brackets included in the set.

The warming ballast can be mounted so that it does not heat up the water (i.e. not in the cabinet below the aquarium).

The measure that can save the most energy is to cover the aquarium! We lose most heat through the water surface and, as already mentioned, the aquarium heater has the highest wattage of all aquarium equipment.

some creatures that do not like a long term temperature of 25 °C and above. These include axolotls (amphibians) and some crayfish and shrimp species. Their optimum temperature is below 23 °C.

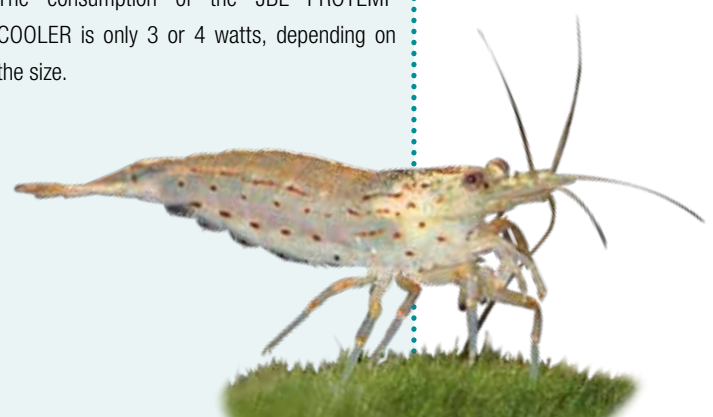
We need to distinguish between summer and winter. In summer the room temperature often rises above 25 °C, so that the heater no longer needs to heat. Practically all tropical ornamental fish tolerate a long term water temperature of 25 °C. Higher water temperatures are only needed when breeding some species, such as the discus. On the other hand, there are

Keeping the cover closed, possibly in combination with cover panes, prevents unwanted heat emission, and equally prevents a heating up. Heating up is not desirable with axolotls and shrimps. With these creatures it's better to open the cover or leave it off altogether.



If the temperature is too high, cooling fans (JBL PROTEMP COOLER) can be used to generate an air current over the water surface which can lower the water temperature by a further 4 °C max.

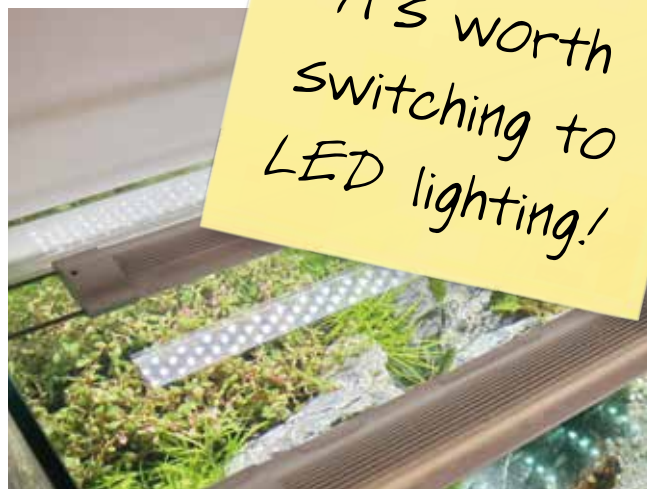
The consumption of the JBL PROTEMP COOLER is only 3 or 4 watts, depending on the size.





Switching from T5 or T8 fluorescent tubes to modern LED technology can save a lot of electricity: If you normally light your 100 cm aquarium with 2 fluorescent tubes of 45 W each, you can save 50 % electricity by switching to an LED lamp! In this example it would be a JBL LED SOLAR NATUR with 44 W, which replaces and even exceeds the light output of two fluorescent tubes). The lighting time can be reduced to a maximum of 10 hours a day without harming the plants. A fish-only aquarium can be lit for even shorter periods, and it is also possible to have a midday break in the lighting so that you have an illuminated aquarium to admire in the mornings and evenings. Something like a midday break can occur in the wild too, when a rain front passes through and darkens the rainforest for a period, as if someone has switched off the lights.

It's worth switching to LED lighting!



Another way to save energy is to dim down the lighting. With fluorescent tubes, this was only marginally possible, but with LEDs it works easily and saves electricity.

Example of the JBL LED SOLAR NATUR, 44 watts for aquariums 85-110 cm long

2700 K colour temperature, with only the warm white LEDs on:

Level	Watt
8 - maximum power	32,3
7 - dimmed	28,3
6 - dimmed	24,1
5 - dimmed	20,0
4 - dimmed	15,9
3 - dimmed	11,8
2 - dimmed	7,6
1 - lowest power	4,1

4000 K colour temperature, with cool white and warm white LEDs on:

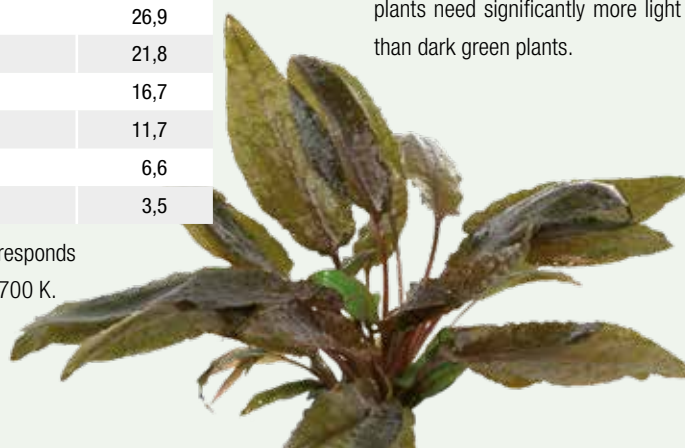
Level	Watt
8 - maximum power	37,1
7 - dimmed	31,9
6 - dimmed	26,9
5 - dimmed	21,8
4 - dimmed	16,7
3 - dimmed	11,7
2 - dimmed	6,6
1 - lowest power	3,5

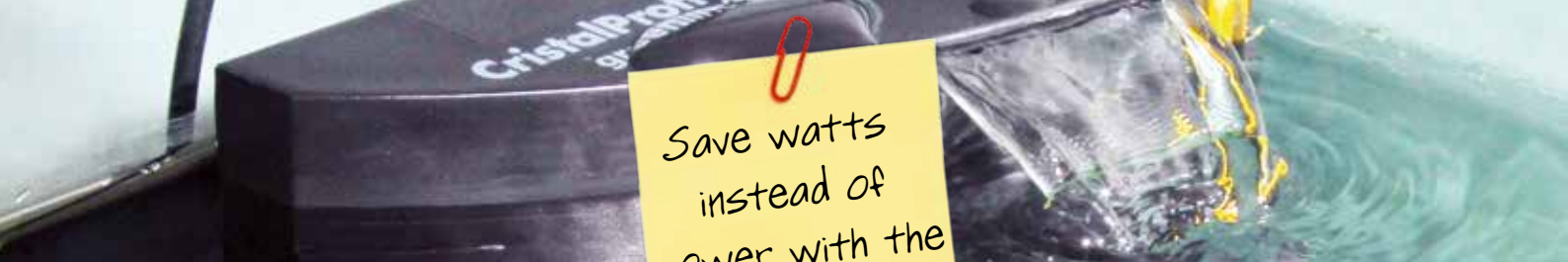
6700 K colour temperature: corresponds approximately to the values at 2700 K.



You can try different dimming levels to find out which one your plants can tolerate without any growth stagnation. Light green and red plants need significantly more light than dark green plants.

It is also interesting to note that changing from 2700 or 6700 K, at which only one type of LED burns in each case, to the maximum amount of light with all LEDs at 4000 K consumes only 13 % more energy (at the brightest level). Going down one level from the brightest level 8 to 7 will give you a saving of 14 %. Going down 2 dimming levels, from 8 to 6, however, will give you 27.5 %.





Save watts
instead of
power with the
filter!

It's worth doing the maths before you purchase a new energy-saving filter. But if you are planning to buy a new one anyway check the energy consumption of your new filter beforehand.

The JBL CristalProfi e series has been designed to be extremely energy-economic thanks to modern technology and a specially constructed impeller. Since aquarium filters run continuously day and night, you'll soon notice the difference a filter with low wattage can make.

There are enormous differences between the power consumption of different manufacturers and models. Some well-established manufacturers produce external filters for

e 402	e 702	e 902	e 1502	e 1902
180 x 210 x 284 mm	180 x 210 x 350 mm	180 x 210 x 405 mm	200 x 235 x 460 mm	200 x 235 x 564 mm
12/16	12/16	12/16	16/22	19/25
450 l/h	700 l/h	900 l/h	1400 l/h	1900 l/h
40-120 l	60-200 l	90-300 l	160-600 l	200-800 l
4 W	9 W	11 W	20 W	36 W
4,6 l	6,1 l	7,6 l	12 l	15 l
1 x 1,1 l	1 x 1,1 l	1 x 1,1 l	1 x 2,3 l	1 x 2,3 l
1 x 1,2 l	2 x 1,2 l	3 x 1,2 l	3 x 1,9 l	4 x 1,9 l

a 300-litre aquarium which consume 24 W, while the JBL CristalProfi e902 runs on only 11 W! Running the JBL filter 24 hours a day saves the aquarist €0.12 a day more than when running the 24 W filter. This adds up to €45.56 per year (electricity prices as of 12/22).



You can often reduce the filter output by using the regulating lever at the outlet, but this does not save any energy! And beware: filters, whether internal or external, must NEVER be switched off at night! This would cause the biology in the filter to die from oxygen depletion, and when the filter is switched on again, it would force excess residue back into the aquarium.




Diaphragm or air pumps bring air into the aquarium through a hose. This air is generally fed into the water through an air stone. In this way, the oxygen content in the water can be increased. However an estimated 90 % of all aquariums already have enough oxygen. It is created when water leaves the filter outlet and its current ripples the water surface. If you are unsure, measure the oxygen content with a water test (JBL PROAQUATEST O₂) in the morning. Only when oxygen values fall below 4 mg/l do they become critical for our aquarium inhabitants. The O₂ level can become too low if medicines and anti-algae agents are used or if there are a lot of plants in the aquarium consuming oxygen at night. Only then do you need an air pump.



There's not
much room for
improvement
with savings on
pumps!

A medium-sized JBL diaphragm pump (JBL PROSILENT a200) consumes 3.4 W. If it is only switched on at night because of the many plants, the power consumption is kept within limits. Air pumps are really only necessary when the oxygen content risks becoming critical. The bubble-generating air stones expel CO₂ (carbon dioxide) from the aquarium water and the plants need this CO₂ to grow. Please only aerate if you have to!





Every degree counts: the lower the temperature the higher the saving!

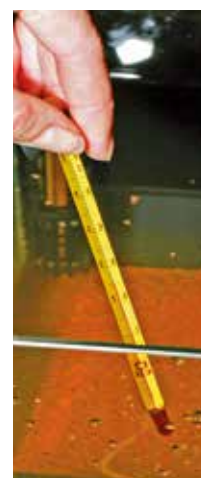


As already mentioned at the beginning, the wattage of a heater does not correspond to the wattage consumed. If you fill your aquarium with new water and wait a day or two, you will get aquarium water at room temperature. Then the heater thermostat (e.g. JBL PROTEMP a100) heats the aquarium water a few degrees above room temperature. As already mentioned, 25 °C is the ideal water temperature for almost all tropical aquarium inhabitants.

To heat water by 1 °C, we need 1.16 Wh per litre. So for a 60 cm aquarium $54 \times 1.16 = 69.6$ Wh. If we want to heat 60 cm from 22 to 25 °C: $54 \times 3 \times 1.16 \text{ Wh} = 188 \text{ Wh}$.

It doesn't matter whether we use a smaller heater that has to heat more often or a larger one that starts less often. Just avoid using very small heaters that are permanently at full load or very large heaters that constantly switch on and off.

It might seem more energy-efficient to keep fish which hail from temperate latitudes, as they don't need any heating at all. The idea is half right. They won't need any heating, but in summer they'll need some intense cooling, as these animals cannot tolerate continuously high water temperatures.



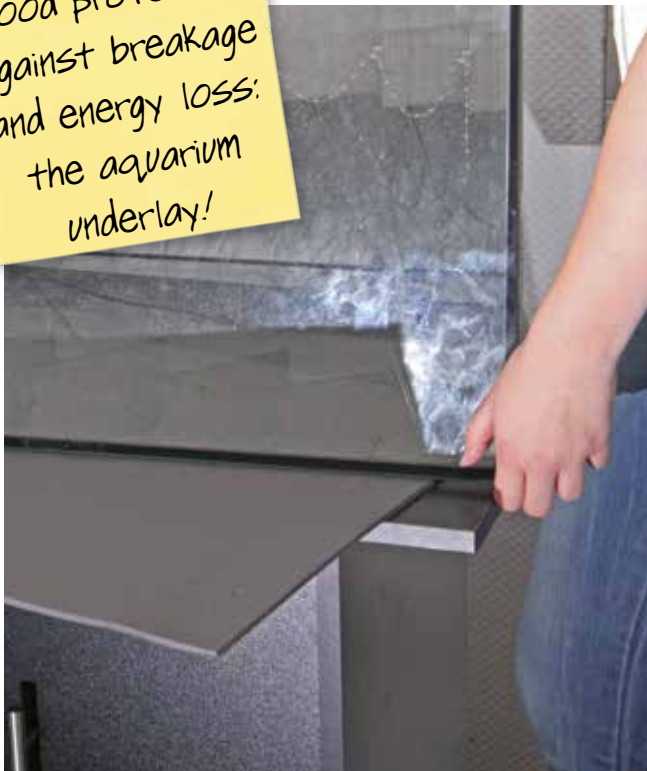
Substrate heaters (JBL PROTEMP b) are NOT designed to heat the water, they are only to flush extra nutrients to the plant roots by circulating water in the substrate, thus promoting plant growth. If the water gets too warm in summer, the substrate heaters that are NOT controlled by a thermostat need switching off completely. The plants will then have to manage with fewer delicious nutrients at their roots for a few weeks.

At night a substrate heater is really not necessary! The plants do not carry out photosynthesis at night and thus hardly absorb any nutrients during the dark phase. Switch on your substrate heater when you switch on your lighting and switch both off at night. We are talking about values between 10 W and 60 W here. At an electricity price of €0.40/kWh, a 20 W floor heater costs 19 cents a day for 24 h operation and 8 cents a day for only 10 h operation per day.



On the ground the costs stay low!

Good protection
against breakage
and energy loss:
the aquarium
underlay!



Most aquarium owners have a mat under their aquarium. This mat, e.g. JBL AquaPad, protects against glass breakage (even a small stone can cause the bottom pane to crack), but also against heat loss. The rule here is: the thicker the mat, the more insulation it provides.

Here we're talking about insulation with slight differences in temperature. It's not like our windows, where we have maybe 5 °C outside and 22 °C inside. With an aquarium we're concerned with the difference between water temperature and room temperature, i.e. a difference of 3 °C. Insulation isn't really that relevant here.

Nearly everyone has an insulating floor mat. Any further insulation on the sides and on the rear pane is hardly needed. Heat loss through the water surface is absolutely the biggest issue here.



By the way: Don't be surprised if the wattage on the packaging of an electrical appliance is different from the wattage indicated by your ammeter! Every electrical appliance is permitted to deviate by about 10 % from its specification and the ammeters also have a certain scatter. In addition, ballasts, e.g. for LED lamps, convert energy into heat and thus generate an amount of energy loss. In the case of JBL LEDs, the ballast does not allow the LEDs to burn at full power so that the service life of the individual LEDs is not shortened.



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