

Insulating hot water pipes for greenhouse heating

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Greenhouses use a lot of energy for temperature and humidity control. Energy is expensive and rapidly rising in price. Hence it becomes more relevant to implement energy saving measures. This article is about insulating hot water transport pipes. This can be one of the first energy saving actions in a greenhouse, because it is effective, simple, relatively cheap and has no side effects.

Heat loss from a pipe

The loss of heat (=energy) from a hot pipe depends on the temperature and diameter of the pipe, and on the conditions around the pipe. The heat loss can be calculated, but that goes too far for this article. It suffices to say that the energy loss of a pipe is higher if the pipe is larger and hotter, and if the surrounding air is colder and the wind speed higher. Insulating (legging) hot water pipes reduces the heat transmission from pipe to surrounding air.

Pipes outside

Priority should be given to legging pipes that are outside. They are often large and hot, and most exposed. **Photos 1 & 2** show examples of proper insulation of external hot water pipes. They are wrapped in industrial insulation blankets (similar to pink bats) and covered by aluminium cladding.

There are some remarks to make though. If there is an option to run the transport pipes inside the greenhouse (that option exists in photo 2), it is often wise to do so. After all, any heat lost then comes inside the greenhouse. Secondly, as hot pipes expand and shrink with changing temperature, they should be placed on brackets or hanging on chains to allow movement and avoid damage. Thirdly, overseas, hot water transport pipes are often put underground, of course with excellent insulation and protection. The advantage of underground pipes is that they are out of the way and don't shade the plants.



Photo 1: insulated transport pipes



Photo 2: insulated transport pipes

Pipes in boiler house

The second priority should be given to legging hot water transport pipes coming directly from the boiler, as they are large pipes and very hot. Equally important is the insulation of the boiler house. Some boilers are situated under a shelter only or in a leaking un-insulated glasshouse. Proper housing in an insulated enclosure (e.g. shed) as well as proper legging of the pipes saves a lot of energy, and increases the energy efficiency.

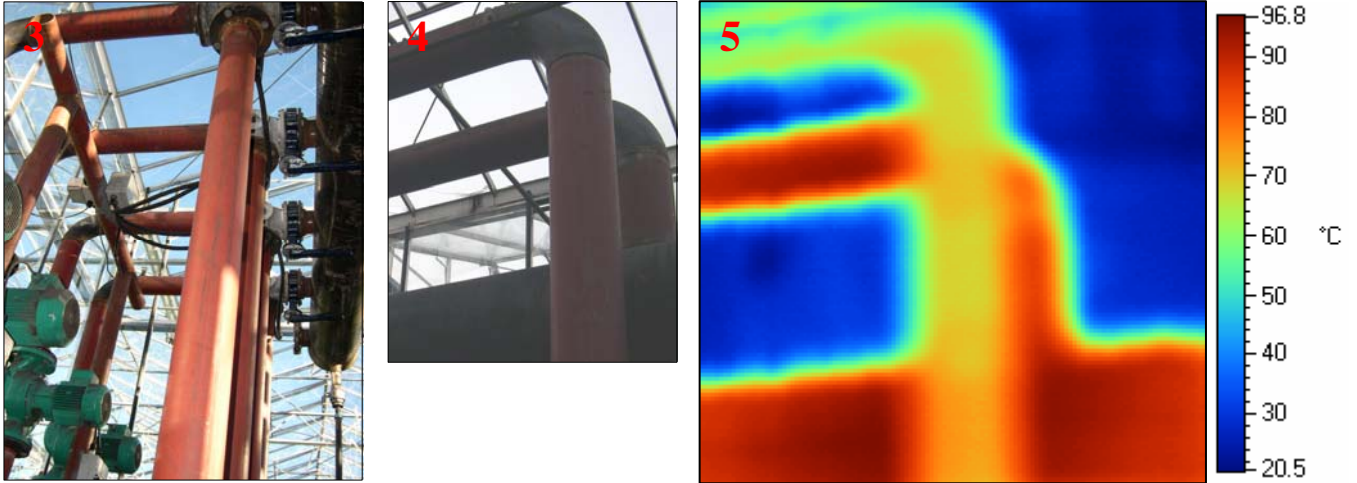


Photo 3-5: (above) show pipes coming from a boiler which is located in an un-insulated glasshouse that also had some broken glass panes. **Photo 5** is an Infra-Red (IR) image, showing that these pipes were nearly 100 °C. Needless to say that a lot of heat is lost (energy is wasted) in this situation, and that improvements can be made.

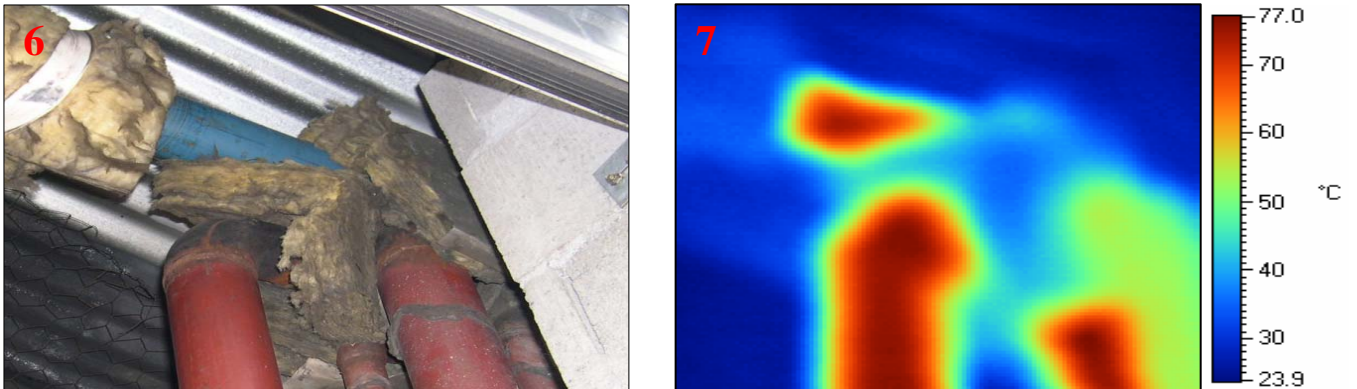


Photo 6: Example of very basic legging of part of hot water transport pipes in a boiler house.
Photo 7: Infra-red photo of the same pipes; no heat loss where insulation material is in place.

Insulation inside the greenhouse

Internal hot water pipes lose their heat inside, which is not as bad as outside. But they create uneven temperatures causing uneven plant growth. Moreover, they dry the air and can burn the plants. **Photo 8** shows pipes that are shielded on one side to protect the plants, but not insulated on the side of the glass. Obviously heat is lost here. **Photo 9** shows perfect legging (same property as Photo 1). White is good for light reflection!!



Photo 8: *Example of poor practice*



Photo 9: *Example of good insulation*

Acknowledgement: we thank the growers who participate in the Vegfed-SFF project on Energy Saving in Greenhouses, where these photos were made.