



Drying hops with thermal solar power: optimization of the energetic efficiency of the process to obtain a hop quality product.

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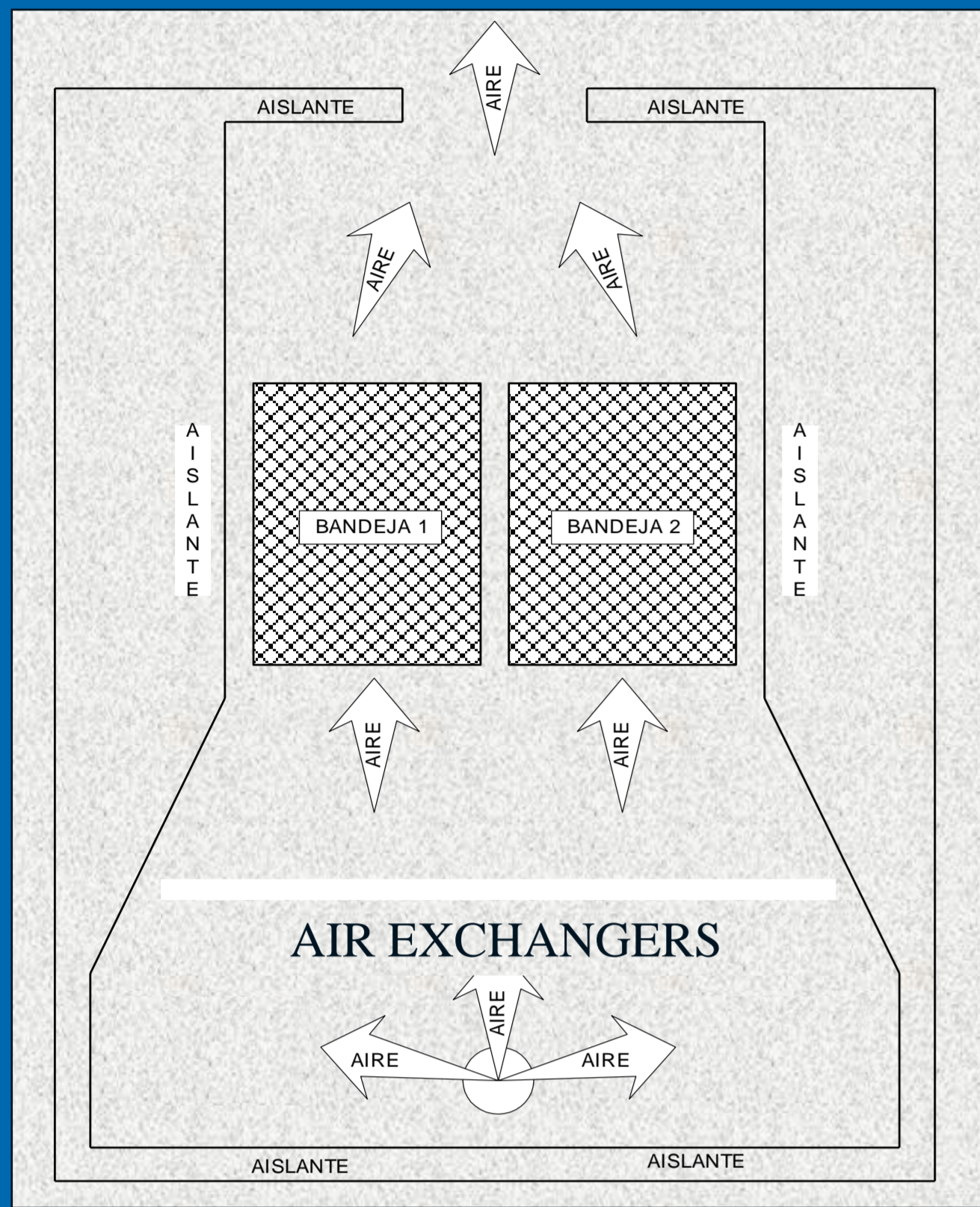
Objectives:

1. Design a HOP DRIER which heat source is SOLAR THERMIC ENERGY.
2. Do researches (with and without hop): Confirm the POSSIBILITY of hop drying with this type of heating source.
3. Make changes needed to IMPROVE the energetic efficiency and the hop quality product.
4. Measure the drying air TEMPERATURES reachable with the SOLAR RADIATION SYSTEM.

Benefits expected:

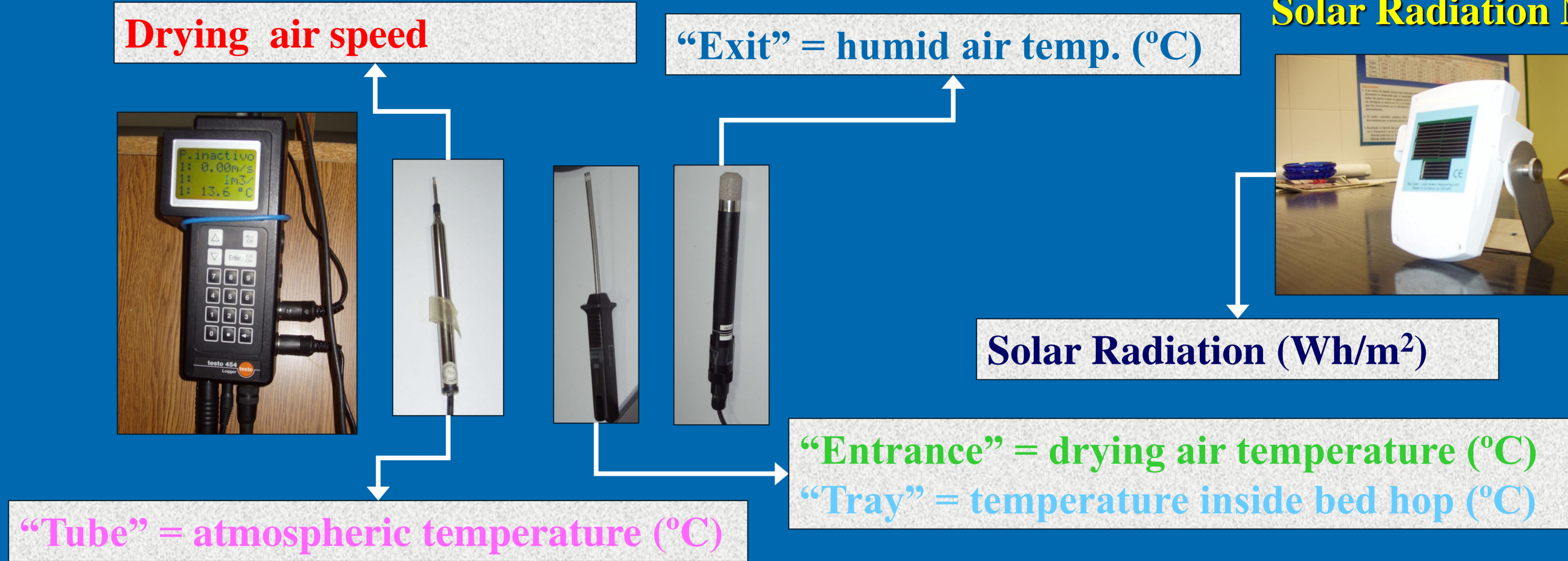
1. Environmental Benefit .
2. Quality of the final product.
3. Energetic Saving.

MATERIALS AND METHODS.



drier prototype scheme

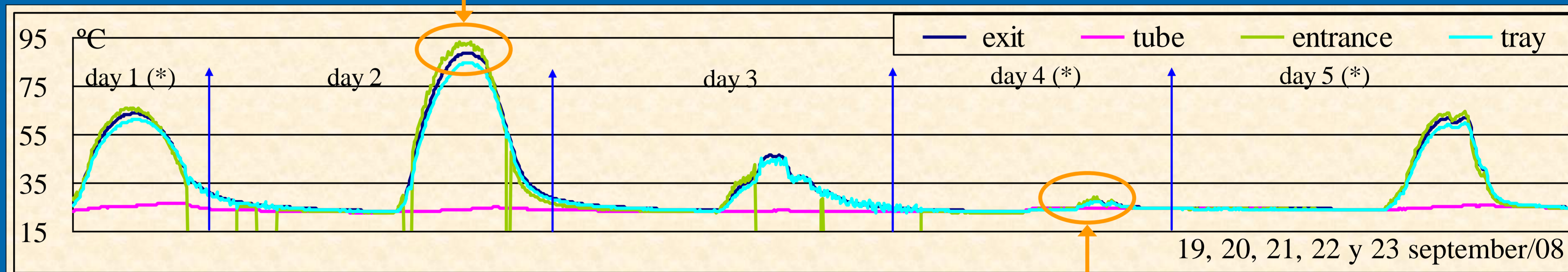
Datalogger and sensors (air speed and temperature)



RESULTS AND CONCLUSIONS.

It is possible to obtain high temperatures. (maximum temp. = 93°C)

The fan DOES NOT affect to the temperature obtained in the drier. (*) with fan



VERY sensitive system to solar radiation (minimum temp.= 30°C)

1st PHASE: Tests without hop: System adjustment

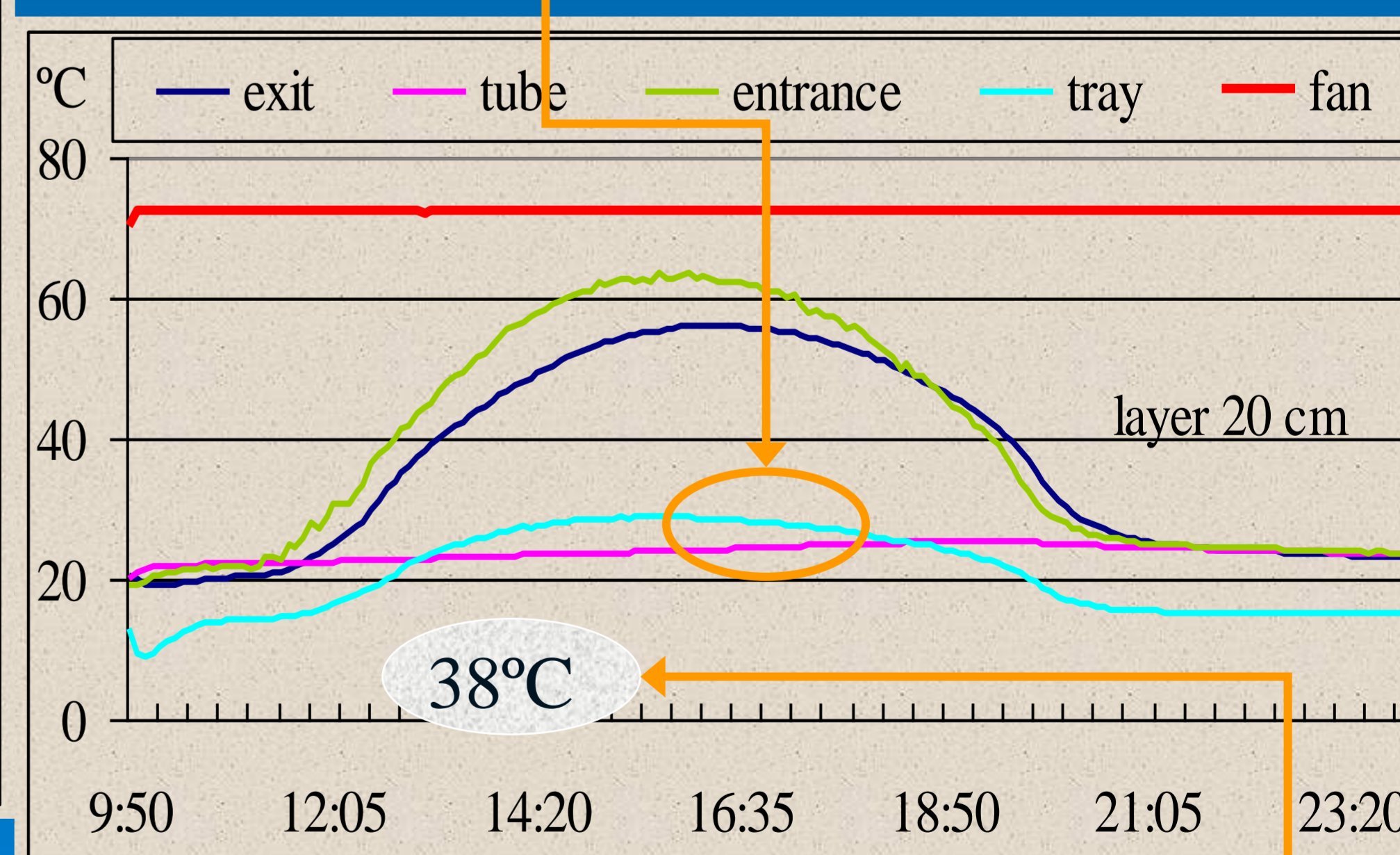
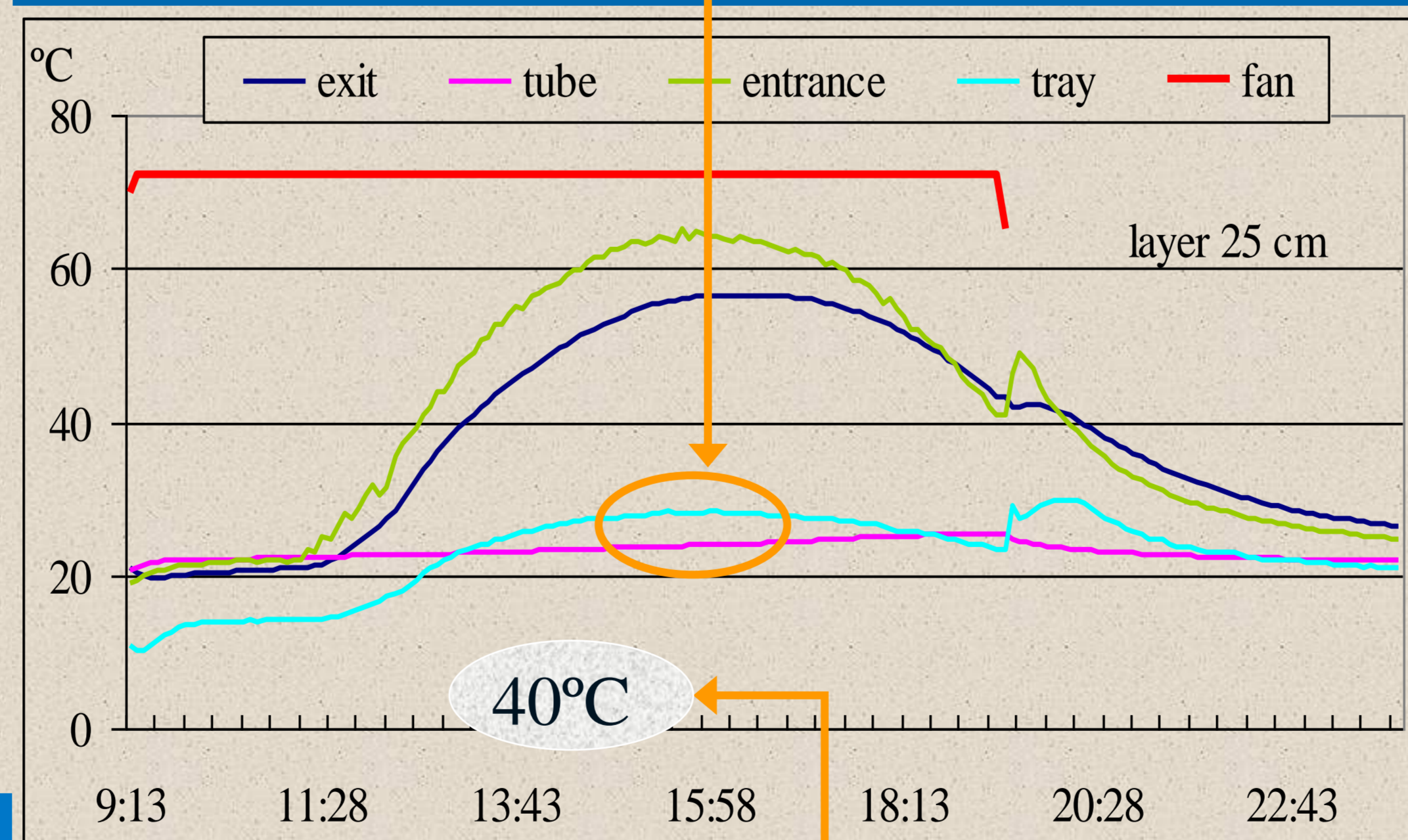
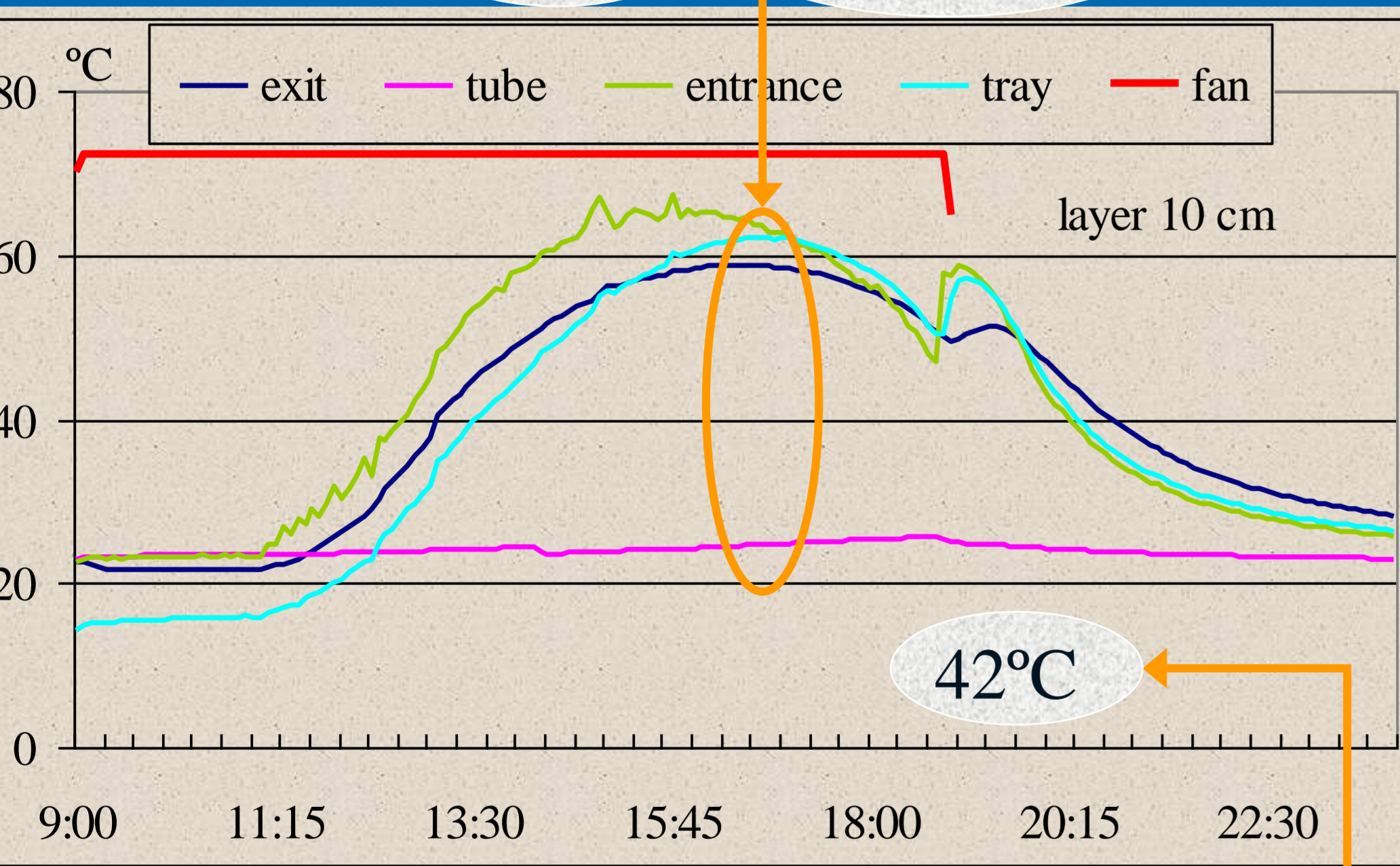
2nd PHASE: Previous Tests with hop: hop layer influence

Deeper layers: the heat is not transmitted properly to the whole hop bed: Hop bed Temp (tray)-atmospheric temp. (tube)

10 cm: 37°C Moisture: 70% to 15%

25 cm: 2,9°C Moisture: 61% to 47%

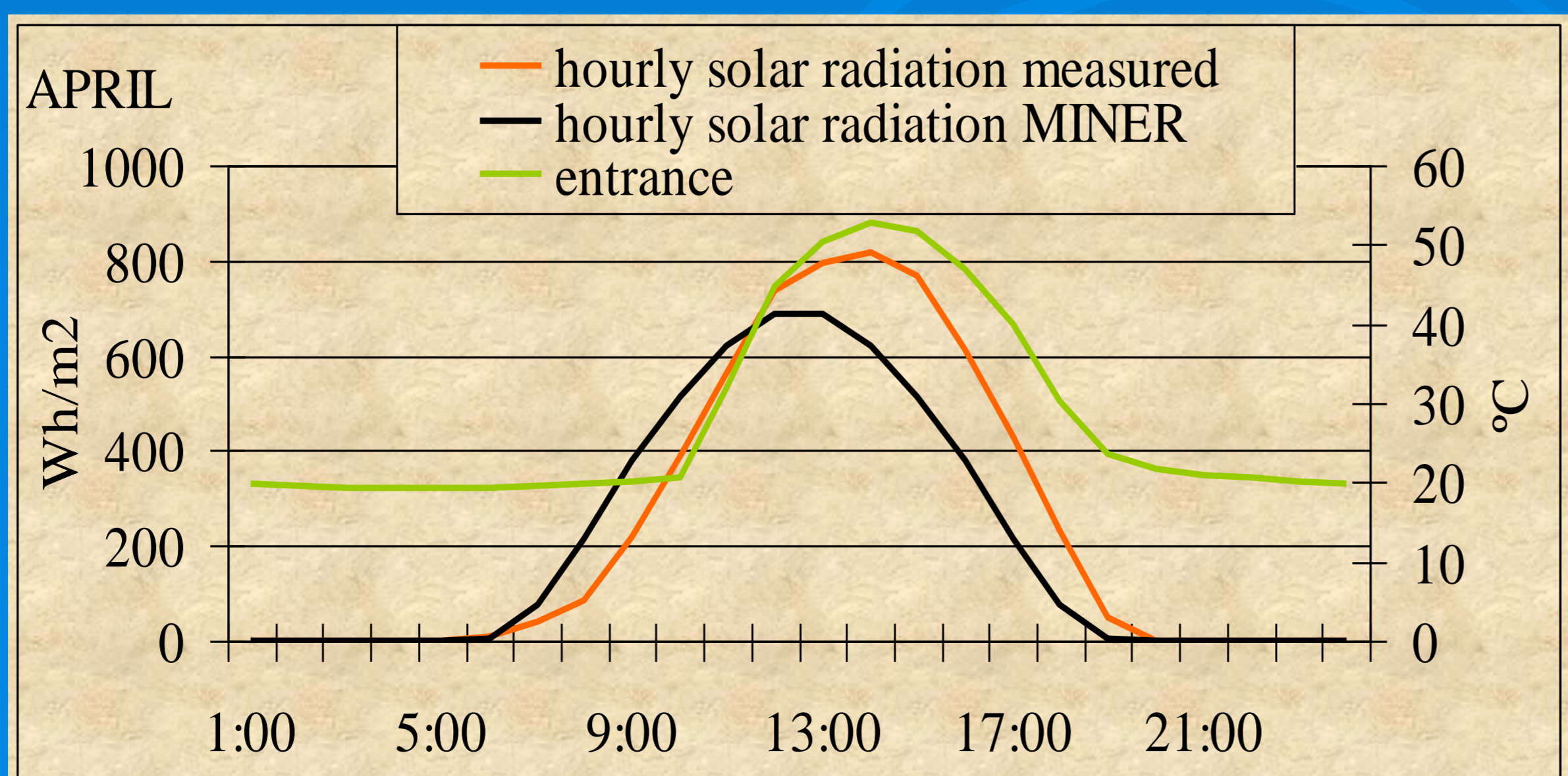
20 cm: 3,5°C Moisture: 69% to 38%



It was obtained correct drying temp. Medium drying air temp. (entrance)=65°C

Correct temperature increase: Drying air temp. (entrance)- atmospheric temp. (tube)

3rd PHASE: Solar radiation and temperatures measures in the drier (without hop- APRIL 2009)



Correlations coefficients:

Solar Radiation measured and information of MINER: 0,937

Solar Radiation measured and drying air temp.: 0,940

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