Certified thermal performance testing provides value for money and has a proven positive impact on the actual system cost

Looking at value for money through myopic eyes blinds reality to expectation, decrease your payback time with Eurovent certification. This article demonstrates the impacts of system economics and how by focusing on the first cost, melts away those perceived benefits like snow on a sunny day.

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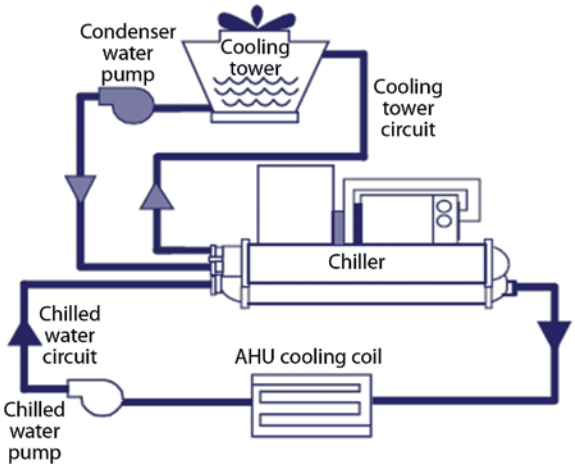
The principle "value for money" is probably as old as human trade and whilst it sounds simple and straight forward, we consider that in reality it is not always straight forward for what a customer expects. Indeed, verification of the real value can be a challenge; verification of quantities, dimensional data, weight, etc. are comparatively easy to assess, but what about the performance of a cooling tower operating in a HVAC plant?

Before we address the problem of performance verification, let us analyse the impact of an underperforming cooling tower using a numerical example of an industrial HVAC application operating year round with a load variation from 100% in summer to 80% in winter. The cooling tower for this application would be selected for a summer condition to cool 52 l/s of water from 32°C to 27°C at an entering wet bulb temperature of 21°C. The cooling capacity to be rejected would be **1,090 kW** in this case.

The cooling tower delivering the required performance, let us designate it as "**Model 100**", would be 3.6 m long, 2.4 m wide and 3.5 m high with an absorbed fan power of 28.5 kW, a 30 kW fan motor would be installed and the overall sound power level of "Model 100" being 93 dB(A).



Now let us analyse this model compared to a cooling tower which would only deliver 80% of the required duty. This cooling tower (we will designate it as "**Model 80**") could be 20% smaller in physical size or alternatively, it would have the same physical dimensions as "Model 100", however the required fan power is only 20 kW and hence the fan motor installed would only need to be 22 kW. This example focuses on the last

option for ease of comparison. In addition, the declared overall sound power level for "Model 80" would be 91 dB(A) instead of 93 for "Model 100". Also the "Model 80" could be available at a slightly lower price.

The question: "Which unit gets ordered" is rhetoric unless the customer knows that "Model 80" underperforms. In order to know that, however, it is not sufficient to look at dimensional data and face values for fan power and sound.

Before we discuss how such verification can be achieved, let us see what the effect of an underperforming "Model 80" provides. What will happen at design conditions and more importantly, what will be the knock-on economics effect on an annual base?

Performance at design conditions.

For the 1,090 kW, which has to be dissipated at 21°C wet bulb, "Model 80" will supply water 1.2°C warmer than that designed. It will take a wet bulb of 19.3°C to supply the required 32°C / 27°C water temperatures. Two deductions can be drawn from that:

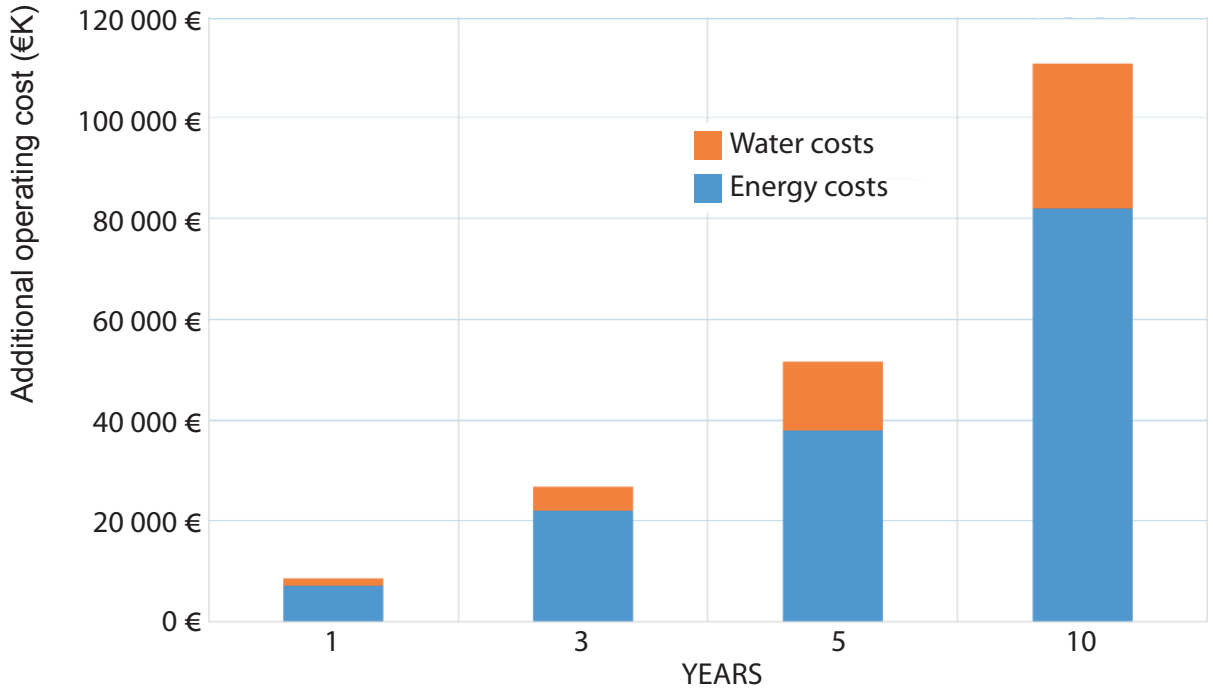
- The installed chiller will not totally stop due to excessive high pressure; due to the 1.2°C warmer water the chiller will unload and capacity will suffer, however it will not fail. Final result will be some loss of comfort or in the case of industrial applications, some slowdown of the production process will for sure take place.
- In typical Mid European climates there will be less than 100 hours when the wet bulb temperature is higher than 19.3°C spread over a few summer days.

Based on those deductions, it is fair to say that on first sight the underperformance does not create a catastrophe or send alarm bells ringing. In fact, there may be several years of bad summers, where design water temperature conditions are never exceeded. So, after all, could it be said that the problem is not so big?

The magnitude however can only be answered if we look at the annual economic impact. With the information we have up to now, we can only say: "Yes, you can get away with offering cooling towers, which deliver only 80% of the required performance". The chances that an operational problem occurs due to the capacity shortage are nil and unless a performance test reveals the true situation, the chances you getting caught are very small.

Under such conditions the likelihood that manufacturers may take risks when stating the performance of their cooling towers is high. Owners may not even challenge their performance data due to the fact that

Cumulative 10 year additional operating cost for 'Model 80' compared to ' Model 100'



Note: Both energy & water costs include an assumed 3% year on year inflation rate price increase

they say: "We never had a problem before." However, we know now that, whilst it may be so that the problem is not noticed, it does not mean that it is not there!

Performance year round.

What we do not know yet is: What is the magnitude of the problem? As mentioned before, we can only answer this question, if we look at the economic annual impact of underperformance. For that we will use the "Models 100 and 80" from the previous example and the industrial HVAC year round load profile varying from 100% capacity requirement in the summer to 80% in the winter. Both cooling towers will use variable frequency drives and run with a concentration factor of 2.5.

The fan kWh requirement for "Model100" will be 55,540 kWh and for "Model 80" it will only be 50,800 kWh, due to the smaller fan motor of the underperforming "Model 80". However, look at the electrical energy needed for the chiller: For the "Model 100" we need 1,114,360 kWh, but for "Model 80" the chiller requirement goes up to 1,178,700 kWh, which is almost 6% more. If we therefore add up the chiller and fan kWh the "Model 80" still needs 5% more electrical energy on an annual base. At a typical cost rate of 0.12 €/kWh this represents an annual operating cost addition of 7,152 €.

In addition to that, there is more water consumption for "Model 80" because the chiller has to work harder hence more waste energy has to be dissipated and more water will evaporate. In our example "Model 80" will consume per annum 500 m^3 water more. If we take the very modest cost for water supply, sewage and chemicals (3 €/m^3), this adds another 1,500 € per year.

The total operating cost for water and electricity for the system with "Model 80" is 8,652 €. This is probably about half the first cost of the new cooling tower. It is clear that an initial small price advantage of the "Model 80" which may exist; melts away those perceived benefits like **snow on a sunny day**.

Conclusion

Value for money does not just come by looking at dimensional data and published values of certain consumables and emissions. What needs to be challenged is the self-declared thermal performance especially if it has never been independently tested or certified. An acceptance test according to a recognized standard is the minimum needed to take out the guesswork in believing the declared thermal performance, but for that the cooling tower needs to be purchased and installed. What now if the tower fails in the test? Penalties, compensations? For sure long and unpleasant discussions, possibly legal action and at the end of all of that the owner is still stuck with a faulty cooling tower.

The smart way to handle this problem is to select a cooling tower which has Eurovent Certified Performance (ECP mark) via 3rd party controlled outside or internal lab testing.

Only then the owner is sure prior to purchase that they will not have higher operation costs due to underperformance.

Certified thermal performance testing removes risk to obtain system economics and removes guess work, it also removes the problems of litigation, penalties & compensation should an already purchased product be found to underperform, because by then it's too late!

Look for the Eurovent Certified Performance mark to make that intelligent Cooling Tower selection decision. ■