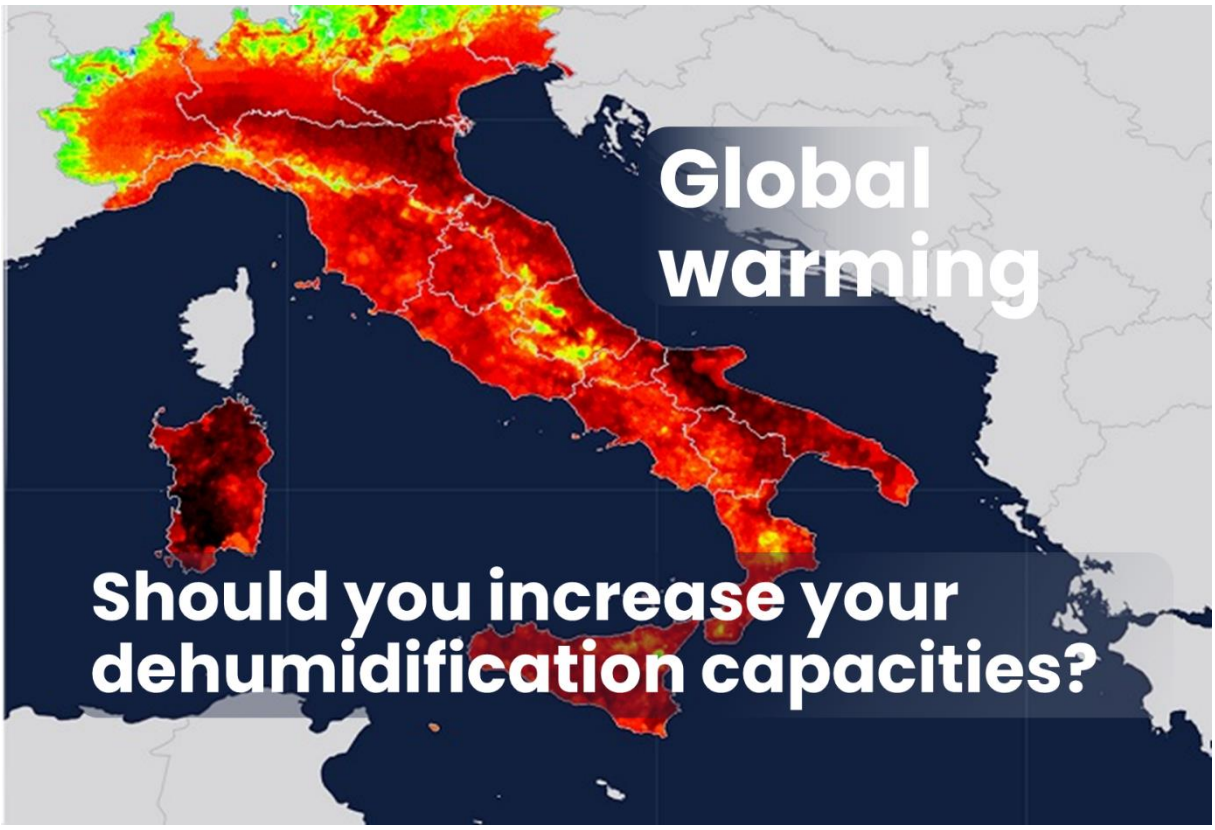
Responding to the challenge of global warming for industrial dehumidification



Global warming and air humidity: a paradox

Global warming is a measured and documented reality. In France, temperatures have already risen by **+1.7 °C since 1900**, a faster rate than the global average (+1.2 °C). And according to projections by the IPCC and Météo France, this trend is expected to intensify, reaching +3 to +5 °C by the end of the century if emissions are not drastically reduced.

However, the rise in temperature has a well-known physical effect: **hot air can contain more water vapour**. This translates into an increase in **absolute humidity** — the amount of water vapour in the air, expressed in g/kg. Paradoxically, this absolute humidity increases while the **relative humidity** (the level of saturation of the air) can sometimes decrease. This is what is called the **paradox of humidity**.

A critical issue for industrial environments

In the industrial sector, the smooth running of manufacturing processes requires controlling **the temperature and relative humidity couple**. It is therefore **absolute humidity** that must be controlled to ensure the conservation of products, health safety or the quality of materials. Maintaining this absolute humidity within specific ranges requires treating the ambient air by removing some of its water, **especially when it crosses a certain threshold**.

But with climate change, these thresholds are reached **more often, for longer, and with higher intensities**.

As a result, the dehumidification systems installed 10 to 20 years ago are **increasingly undersized**.

Concrete cases across Italy

STEM, which designs and supplies dehumidification solutions for manufacturers, has analysed several customer cases in different regions of Italy (data obtained through the https://power.larc.nasa.gov/data-access-viewer service).

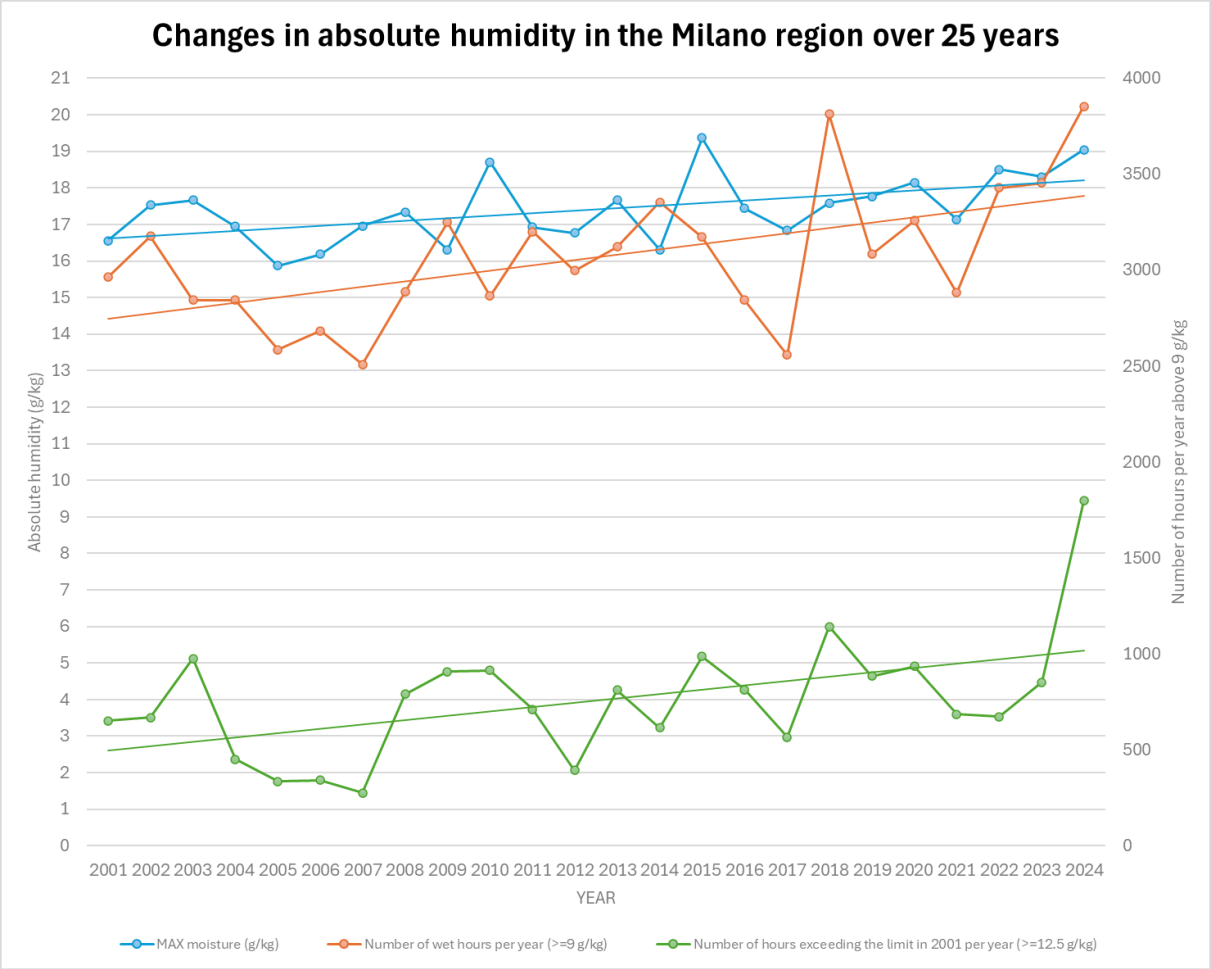
The objective: **Measuring the impact of global warming on humidity conditions** that legacy systems face.

NB1: The threshold of 9 g/kg is chosen to be the comfort threshold at 20°C in a living or working room (60% relative humidity at 20°C)

NB2: The values mentioned come from a linear regression over the period 2001-2024 in order to smooth out the influence of particularly dry or particularly wet years

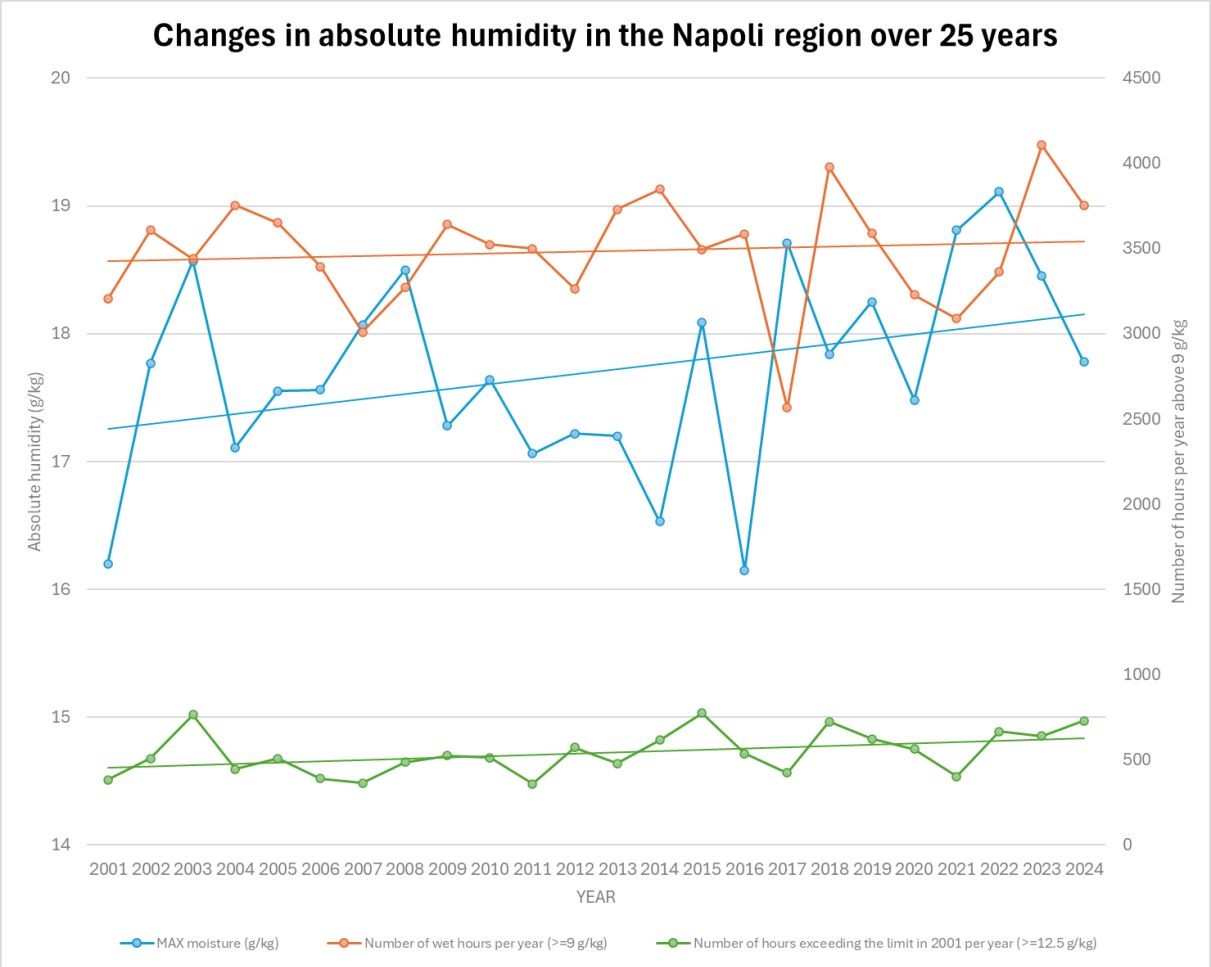
Case N°1 – Milano – Powder-based production (2001 installation)

- Max absolute humidity: **+19%** (16 to 19 g/kg)
- Number of Hours with Humidity Above 9 g/kg: **+22,5%** (from 2720h to 3360h/year)
- Number of Hours with Humidity Above 13 g/kg (Critical Threshold Chosen for System Design in 2001): **x2.0** (from 498 hours to 1016 hours/year)
- ➤ **Consequence: 42 days/year at risk of non-compliance, sharp increase in energy consumption**
- **In 2024, this is more than 70 days above the critical threshold!**



Case N°2 – Napoli – Agri-food production (2001 installation)

- Max absolute humidity: **+6%** (17 to 18 g/kg)
- Number of Hours with humidity above 9 g/kg: **+3,5%** (from 3419h to 3536h/year)
- Number of Hours with Humidity Above 12.5 g/kg (Critical Threshold Selected for System Design in 2001): **+40%** (from 452h to 628h/year)
- ➤ **Consequence: 26 days/year at risk of non-compliance**
- **In 2024, this is more than 30 days above the critical threshold!**



⚠ Economic consequences and the need for adaptation

The economic consequences of these changes are significant. **Dehumidification systems installed more than 10 years ago are becoming undersized**. Increasing their energy consumption leads to higher operational costs. In addition, production stoppages due to inappropriate humidity levels can lead to production losses and additional costs.

The accumulation of periods of high absolute humidity causes:

- A **significant increase in energy consumption**
- Premature **wear and tear** of existing systems
- More **frequent** production stoppages
- Loss **of products or quality**

It is therefore imperative for industries to re-evaluate and adapt their dehumidification systems to cope with these new climatic conditions. This can include investing in more efficient technologies, updating existing systems, and implementing more robust moisture management strategies.

💡 NEODRY: a technological response to adapt and remain competitive

The data is clear: **global warming is significantly degrading the performance of dehumidification systems installed years ago**. The stakes are economic, energy, but also strategic.

With **NEODRY**, STEM offers an **operational, sustainable and cost-effective response**, which allows manufacturers to:

- Maintain the **quality of their products**
- Reduce their energy consumption by up to **75%** and therefore obtain **a quick return on investment**
- Prepare for **carbon and regulatory requirements**
- **Strengthening their resilience** to climate change