



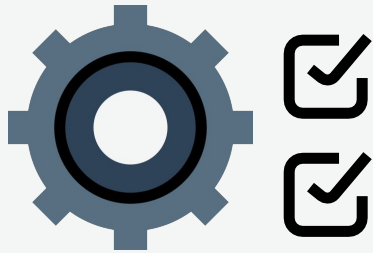
CASE

# TEMPERATURE AND HUMIDITY CONTROL FOR PRODUCT CERTIFICATION CHAMBER

*Home Appliances Sector*

---

## MAIN BENEFITS OBTAINED



Temperature and humidity control **within desired accuracy** and even with **faster dynamics** **than required** by the application

## **PARTNER COMPANY**

A partner company installed the electrical panels for the chamber, and requested Ledefi's expertise on Process Control.

## **WHEN**

2021

# **CLIENT & CONTEXT**



## **CONTROLLED ENVIRONMENT**

The service was executed at a white goods industry in Brazil.

This industry has several large chambers, where products stay several days under controlled temperature and humidity, for certification tests.

# **AN IMMEDIATE NEED**

**After a technological upgrade in one of the test chambers, client performed several attempts to tune the temperature and humidity controllers, without success.**

**Ledefi was then called.**

**First, we collected open-loop data. Through design and simulations, an initial controller tuning was soon obtained for the short term.**

**This tuning provided a good performance on temperature control, but humidity control was still affected by external disturbances.**

**An improved tuning was obtained in a second step, resulting in good performance in both temperature and humidity control.**

# NEEDS AND CHALLENGES

## TEMPERATURE REQUIRED ACCURACY

*+/- 0,5 °C*

## HUMIDITY REQUIRED ACCURACY

*+/- 1,5 %*

## MAIN NEED

Reach stability in temperature and humidity control.

## PROJECT DEADLINE

Ledefi entered the project when it was already behind schedule. Client needed to restart the process as soon as possible.

## SEVERAL CHALLENGES

Accuracy limits were very strict.

Humidity control was highly disturbed by the cooling actuator.

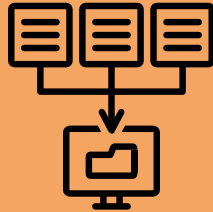
Process open-loop dynamics very slow. Each test took a couple of hours.



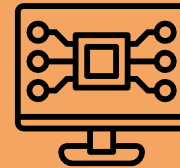
**SOLUTIONS DELIVERED**

# FIRST THINGS FIRST

EVEN BEHIND SCHEDULE, IT WAS NECESSARY TO STOP THE CURRENT COMMISSIONING AND ESTABLISH THE FOLLOWING ACTION PLAN WITH THE CLIENT.



**Stop current tests and start new ones,  
focusing on open-loop data collection**



**Process modeling and simulation in order to  
obtain a good controller tuning**

**Current control architecture included 3 PID controllers:**

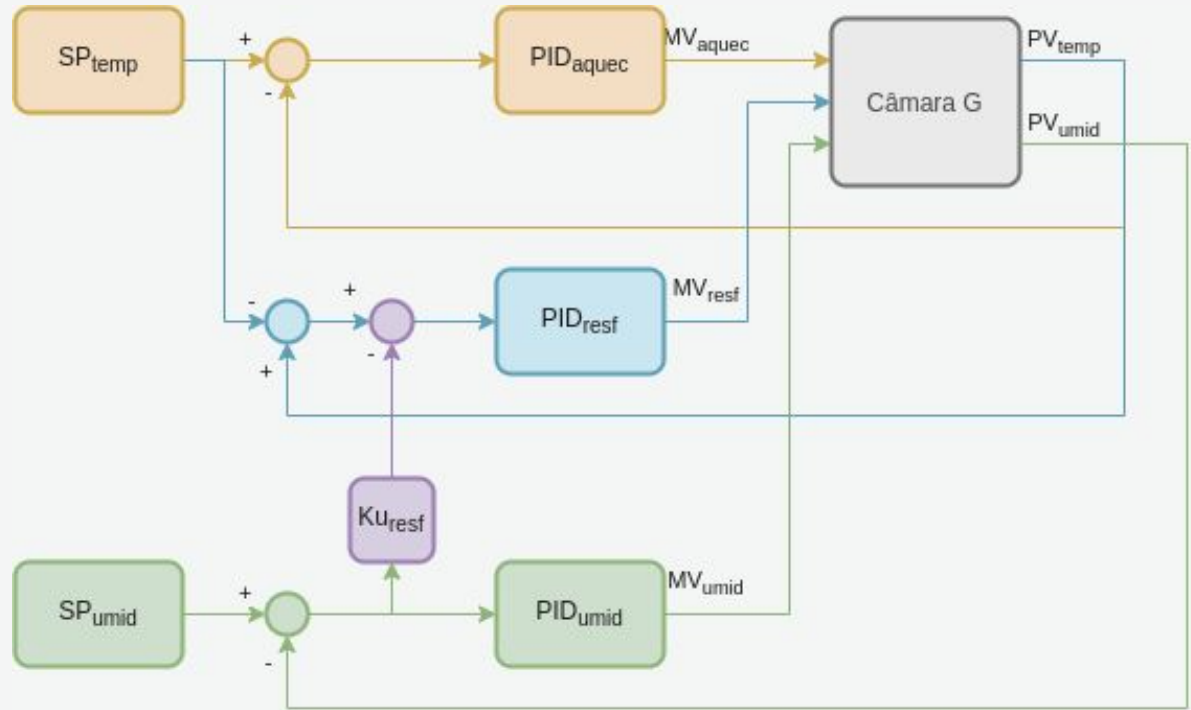
- **Temperature control through chamber heating resistor**
- **Temperature control through cooling chiller**
- **Humidity control through boiler heating resistor**

---

**Ledefi kept the original architecture, minimizing modifications, and included a humidity correction through the cooling PID (purple boxes on next slide), necessary to reduce oscillations on humidity.**

see next slide





# GRAPHICAL REPRESENTATION



# DELIVERABLES

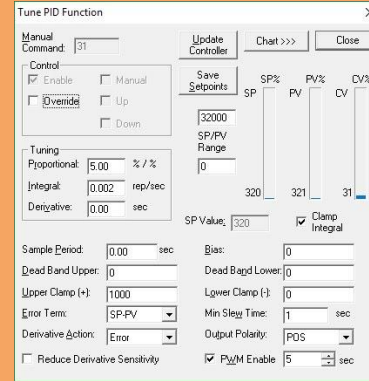
- PID CONTROLLERS TUNED AND COMMISSIONED

- NOVUS PLC AND HMI PROGRAMS, TESTED AND COMMISSIONED

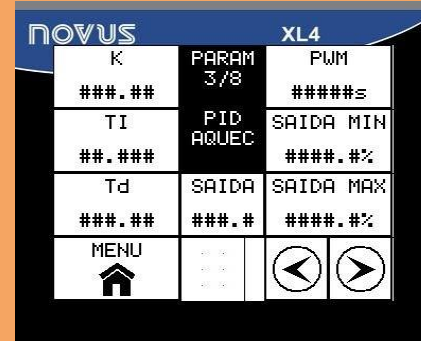
- FUNCTIONAL DESCRIPTION DETAILING ALL MODIFICATIONS

# TECHNOLOGIES & BRANDS

- Modeling and simulation on Matlab / Simulink for PID tuning.



- Programming of PLC / HMI Novus.



HMI screen

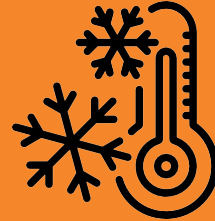
Client was pleased with the control performance. Temperature control was faster and humidity control significantly more stable, comparing to the other 10 existing chambers.



**CUSTOMER  
SATISFACTION**



# WHERE ELSE CAN IT BE IMPLEMENTED?



Processes with heating and cooling chambers, under controlled temperature, humidity and eventually other variables.

---

## **WHY SHOULD I CHOOSE LEDEFI?**

Besides our knowledge and experience on automation and process control projects, we count more than 30 challenges delivered to the industries, all of them with customization and commitment.

## ADDRESS

Condominio Perini Business Park  
Joinville(SC) - Brazil

## PHONE / WHATSAPP

+55 47.98858.2917

## E-MAIL

[challenges@ledefi.com.br](mailto:challenges@ledefi.com.br)

Please contact us to receive other cases that may be applied to your challenge.

# WHAT IS YOUR CHALLENGE?

