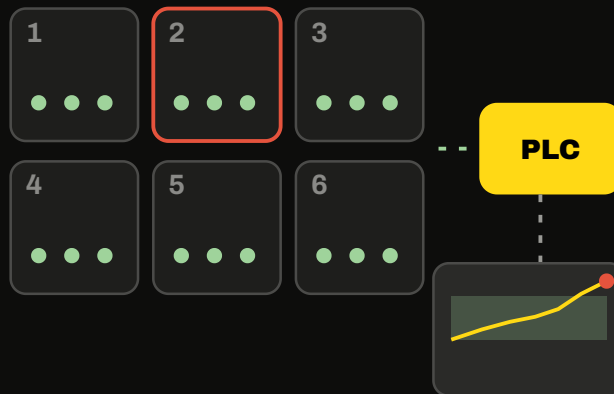


PHARMA · M-DUINO 58

Six culture rooms. One band per batch.

Five indicators per room, M-Duino PLCs and alarms that follow each batch.

[Read the interactive case study online ›](#)


Schematic illustration

6

rooms for different types of cultures and research

5

indicators: temperature, humidity, CO₂, light and pressure

16

analog inputs, 0 to 10 V, on each

M-Duino 58

1

set of alarm thresholds for each batch or product

THE CHALLENGE

Keep every culture inside its band, in six different rooms.

The molecule and drug development sector needs specific environmental conditions in its rooms to keep the quality and efficacy of its products. This company has six rooms for different types of cultures and research. A deviation can interfere with a study, or force it to discard a whole batch. Cultures like these take a large investment of materials and people.

01

Temperature is critical

In storage and culture, the temperature thresholds must stay stable, so as not to interfere with the study and to avoid discarding entire batches.

02

Humidity in most tests

Moisture is the other key indicator during the process of the vast majority of tests.

03

CO2: rarely wrong, costly to fix

CO2 can affect these processes a lot. It rarely changes, but the equipment that keeps it in range is usually very expensive. So its monitoring must be fast and reliable.

04

Light and pressure, where they count

Light is not present in every process, and some need special light conditions. Small batches in small spaces are rarely affected by pressure, so one sensor was installed as a sample.



Levels that change with each batch

The necessary levels are not a constant. The system has to compare each reading with the thresholds of the batch that is in the room at that moment.

HOW IT WORKS

Three stages: measure, compare, record and warn.

Stage 1 · Measure

Each room reports its indicators to an M-Duino 58.

Sensors made for clean room use measure each room. The M-Duino 58 reads them with a program written in the Arduino IDE and keeps the latest value of each indicator.

- Temperature, humidity and CO2 in every room
- Light where the process uses it
- One pressure sensor as a sample

Stage 2 · Compare

The band comes from the batch, not from the room.

Node-RED compares each reading with the thresholds of the batch or product in the room. When a new batch comes in, its thresholds replace the old ones.

- One set of thresholds per batch or product
- A warning before the limit, an alarm at the limit
- The thresholds change when the batch changes

Stage 3 · Record and warn

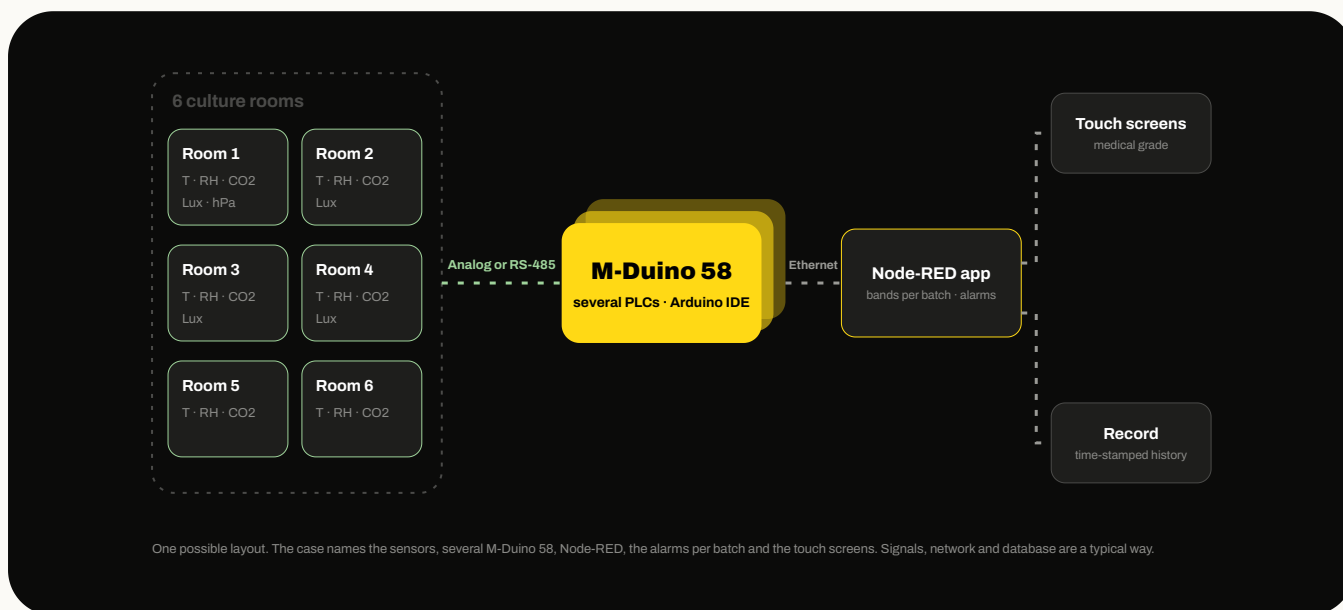
Every reading is recorded. Every deviation is shown.

The Node-RED application records the readings of all the rooms and shows them on medical-grade touch screens. Warnings and alarms appear there. A typical way to close the loop: an operator acknowledges each alarm. Start an event, then acknowledge the alarm.

- A time-stamped record of every reading
- Alarms on the touch screens
- A sensor fault is an alarm too

How do PLCs monitor pharmaceutical culture rooms?

Sensors in each of the six rooms measure temperature, humidity and CO₂, and light and pressure where they are needed. Several M-Duino 58 PLCs read them. A typical way: transmitters with a 0 to 10 V output on the analog inputs, or digital sensors on RS-485. Over Ethernet, a Node-RED application gets the readings of all the rooms, compares them with the thresholds of each batch or product, records them and shows the warnings and alarms on medical-grade touch screens.



— Sensor signals — PLCs — Ethernet

Signals and data

Signal	Between	Type	Purpose
Temperature and humidity, each room	Room sensors → M-Duino 58	Analog 0-10 V	The two key indicators of storage and culture (typical way)
CO ₂ , each room	CO ₂ sensor → M-Duino 58	Analog or RS-485	A fast, reliable reading of a costly variable
Light, where used	Light sensor → M-Duino 58	Analog 0-10 V	Special light conditions of some processes
Pressure, sample point	Pressure sensor → M-Duino 58	Analog 0-10 V	Observe if it affects the batches; ready for more points
Readings of all rooms	M-Duino 58 → Node-RED	Ethernet	Modbus TCP or MQTT (typical way)
Thresholds of each batch	Inside Node-RED	Profile	Warnings and alarms per batch or product
Record	Node-RED → database	History	Every reading with its time (typical way)
Dashboard and alarms	Node-RED → touch screens	Ethernet	Values, warnings, alarms and acknowledge

HARDWARE USED

M-Duino 58 PLCs, one or more per group of rooms.



M-DUINO ETHERNET PLC ARDUINO 58

An industrial PLC built around an original Arduino Mega 2560, with 36 inputs and 22 outputs, Ethernet, RS-485, RS-232, I2C, a real-time clock and a microSD slot, for DIN rail. In this case, several of them read the room sensors and pass the values to the Node-RED application.

Role	Read the room sensors, send the values over Ethernet
Inputs	36: 16 analog/digital (0-10 V, 10-bit), 20 digital optoisolated (5 to 24 Vdc)
Outputs	22: 8 analog/digital/PWM (0-10 V), 14 digital optoisolated (5 to 24 Vdc)
Comms	Ethernet 10/100 (W5500), RS-485, RS-232, TTL serial, I2C, SPI
Built in	Real-time clock, microSD slot
Programming	Arduino IDE with the Industrial Shields boards package

The case calls it the M-Duino Arduino PLC 58+. It uses several of them and does not say how many, nor how the rooms are split between them.

[See the M-Duino 58 ›](#)

Thresholds per batch

The levels are not a constant. Keeping the thresholds per batch or product, not per room, is what lets the alarms follow the work in the room.

Several PLCs, one picture

Each M-Duino 58 reads the rooms near it. Node-RED brings all of them into one dashboard and one record.

Fast where it costs most

CO2 rarely changes, and fixing it is expensive. A short alarm delay and a check of the sensor signal give a fast, reliable answer.

SIMILAR PROJECT?

Tell us your rooms and your batches. An engineer will answer.

Tell us how many rooms you have, what you measure in each, how your thresholds change from batch to batch, and where the alarms and the records must go. We will tell you which controllers fit, and how to wire the sensors.

READ IT ONLINE

industrialshields.com/case-study-pharmaceutical-culture-room-monitoring-arduino-plc

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