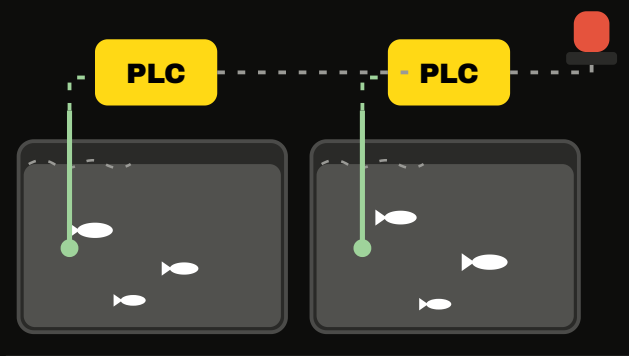


FRY HATCHERY · ARDUINO PLC

Spot fry disease early. **PLCs** watch the water.

Water, feeding and light under constant watch, on Arduino based PLCs.

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


water, alerts and response
Schematic illustration

4

risk factors named by the case: temperature, water quality, feeding and lighting

5

critical variables: temperature, salinity, pH, oxygen and fish behaviour

4

PLCs on one Ethernet switch with Modbus TCP, in the scheme of the case

3

response actions named: stop the feed, adjust the water, give medicine

THE CHALLENGE

Keep every batch of fry healthy, with less human error.

The aim of a fry hatchery is to produce high quality fish for later sale. That needs constant control of the environment and the living conditions, for the welfare, the health and the growth of the fry, and to meet quality and animal welfare standards. The goal of the project: automate disease detection with PLCs in a monitoring system, to reduce human error and to prevent disease caused by four factors.

01

Temperature

Sudden changes or extreme temperatures stress the fry and make them more likely to get ill. The water temperature must stay constant and right for them.

02

Water quality

The water needs a suitable chemical composition and no contaminants. Regular monitoring finds problems before a disease starts.

03

Feeding

The fry need an adequate, balanced diet. A poor diet weakens their immune system and makes them more likely to get ill.

04

Lighting

Changes in the cycles of light and dark can alter their circadian rhythms, their behaviour and their metabolism. The light cycle must stay regular.



Why it matters

Manual tests and analysis take time and leave room for error. The case automates them: more accurate detection, an early diagnosis, and preventive measures before a disease spreads.

HOW IT WORKS

Three jobs: watch the water, decide the alert, respond.

Job 1 · Watch the water

Temperature, salinity, pH and oxygen, all the time.

The sensors send their data to the PLCs all the time. Each PLC compares the readings with the limits and detects changes in the critical variables. Change the conditions and watch zone 1.

- Analog or digital sensors on each PLC
- Temperature, salinity, pH and dissolved oxygen
- A change in a variable is the first sign

Job 2 · Decide the alert

Boolean logic decides when to warn.

A reading out of range is not always a disease. The PLCs combine conditions with algorithms and Boolean logic, and only then light the visual signal for the operators.

- Water out of range, and for how long
- Fish behaviour seen by the cameras
- A visual signal for the operators

Job 3 · Respond

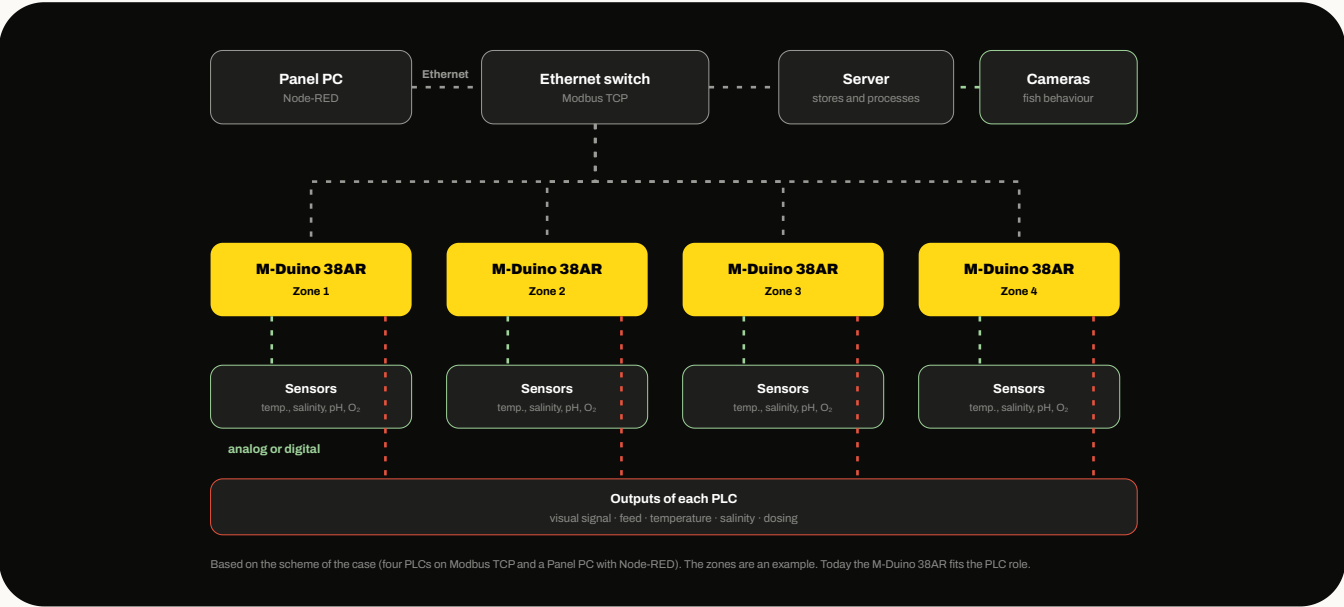
Stop the feed, fix the water, give the medicine.

Once an alert fires, the PLCs carry out the response actions set for it. An automatic dosing system gives the medicine with precision and control.

- Stop the feed supply
- Adjust the water temperature or salinity
- Automatic dosing of medicine

How do PLCs detect disease in a fish hatchery?

Put one PLC in each zone of the hatchery and connect its sensors: analog or digital, for temperature, salinity, pH and oxygen. Cameras watch the behaviour of the fish. The PLCs read the data all the time and detect changes. Link the PLCs to an Ethernet switch with Modbus TCP. A Panel PC with Node-RED shows and controls the system, and a server stores and processes the data. When the Boolean logic of a PLC fires an alert, it lights a visual signal and runs the response: stop the feed, adjust the water or dose the medicine.



Sensors and cameras PLC in each zone Ethernet and Modbus TCP Alerts and actions

Signals and data

Signal	Between	Type	Purpose
Water temperature	Sensor → PLC	Analog or digital	Sudden changes or extremes stress the fry
Salinity	Sensor → PLC	Analog or digital	Part of the water quality
pH	Sensor → PLC	Analog or digital	Part of the water quality
Oxygen level	Sensor → PLC	Analog or digital	A critical variable named by the case
Fish behaviour	Cameras → analysis system	Video	A change can show a disease. The case does not publish how the images are analysed
Readings and states	PLCs → switch → Panel PC	Modbus TCP over Ethernet	Central view and control with Node-RED
Data	System → server	Not published	The server stores and processes the data
Alert	PLC → operators	Visual signal	Fired by algorithms and Boolean logic
Response	PLC → feeder, water, dosing	Outputs	Stop the feed, adjust temperature or salinity, give medicine

HARDWARE USED

The PLC of the case, today. And a panel for Node-RED.



CURRENT EQUIVALENT

M-DUINO ETHERNET PLC ARDUINO 38AR

One PLC per zone.

Role in this design	Reads the sensors of one zone, runs the alert logic and the response actions
Controller	Arduino Mega 2560, programmed with the Arduino IDE
Inputs	19: 10 analog/digital (0-10 V, 10-bit) and 9 digital optoisolated, 5 to 24 Vdc, 4 with interrupt
Outputs	19: 8 relays (230 Vac 4 A), 6 analog/digital/PWM (0-10 V) and 5 digital optoisolated
Communications	Ethernet (W5500) with Modbus TCP, RS-485, RS-232, I2C, SPI

The case used the M-Duino 54ARA (29 inputs, 14 of them analog; 25 outputs, 8 of them relays), no longer in the web shop. The M-Duino 38AR has the same kind of analog and relay modules, with fewer analog inputs.

[See the M-Duino 38AR ›](#)



OPTION FOR THE PANEL

TouchBerry Pi Panel PC 10.1" FLEX

The scheme of the case shows a Panel PC running Node-RED, linked to the PLCs over Ethernet.

Role in this design	Node-RED dashboard: readings of every zone, alerts and control
Screen	10.1" touchscreen
Base	Raspberry Pi
Link to the PLCs	Ethernet, Modbus TCP

Not named in the original case.

[See the TouchBerry Pi 10.1" FLEX ›](#)

Fewer human errors

The PLCs read every variable the same way, every time. The case expects more accurate detection than with manual tests and analysis.

Faster results

Automated tests and analysis take much less time. The results come sooner, and so does the response to an outbreak.

Logic you can read

The alert rules are Boolean logic in the PLC program: conditions, delays and combinations that the team can check and change.

MONITORING TANKS OF FISH?

Tell us about your hatchery. An engineer will answer.

Tell us the species, how many tanks or zones you have, which variables you measure and what the system must do when something goes wrong. We will propose the PLCs, the network and the panel.

READ IT ONLINE

industrialshields.com/case-study-fr-y-hatchery-disease-detection-arduino-plc

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