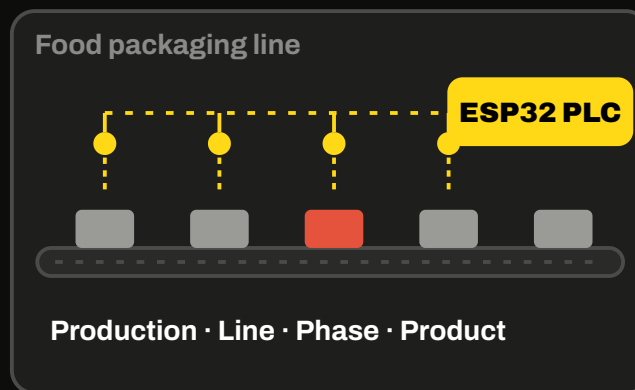


FOOD PACKAGING · ESP32 PLC

An old packaging line. **New data at four levels.**

A retrofit with the ESP32 PLC: OEE, energy and product data from a line that gave none.

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


ESP32 PLC → Central system → BI
Schematic illustration

4

data levels: production, line, phase or machine, and product

OEE

indicators from specific sensors wired to the PLC

BI

platform fed in real time through the central system

Phase 1

of the retrofit: the digitalization of the line

THE CHALLENGE

A line that worked, but could not grow or talk.

The goal of the project was to improve the efficiency of the machine and to give it more flexibility for production needs that change all the time. The old control system stood in the way.

01

Little power, little memory

The old control system had limited processing capacity and memory. New functions could not be added to it.

02

Not connected

The line had no network link and could not be integrated with other industrial systems. Collecting data and making informed decisions was hard.

03

No line figures

Energy consumption, running, stop and changeover times, yields per shift and the incidents of each product were not available.

04

Each product changes the line

Packing one product or another can alter how the line behaves, with more stops or breakdowns. The size of the product or pack and the marking system (label, ink or laser) play a part.



First phase: digitalization

The two companies set four goals for the first phase: data on production, data at line level, data at phase or machine level within the line, and data at product level.

HOW IT WORKS

Three jobs: time the line, find the weak spot, plan the next batch.

Job 1 · Production data

Time the line to get its OEE.

To set OEE indicators on the line, the case needed a set of key data. Specific sensors connected to the PLC now collect it. A typical way to turn those signals into OEE: count good and rejected packs, and log each stop and each product changeover with its start and end. Add stops, add a changeover or slow the line, and watch the OEE of the shift.

- Run, stop and changeover times
- Good and rejected packs
- OEE by shift, from the PLC data

Job 2 · Line, phase and product

Which product, in which phase, stops the line?

One product can make the line stop more often than another. With sensors by phase or machine, the case can now see which combination of product, pack and phase runs best and which one has more incidents. The line level data adds the energy consumption.

- Stops by phase or machine
- Energy of the line by product
- The weak combination, found in the data

Job 3 · Real time and planning

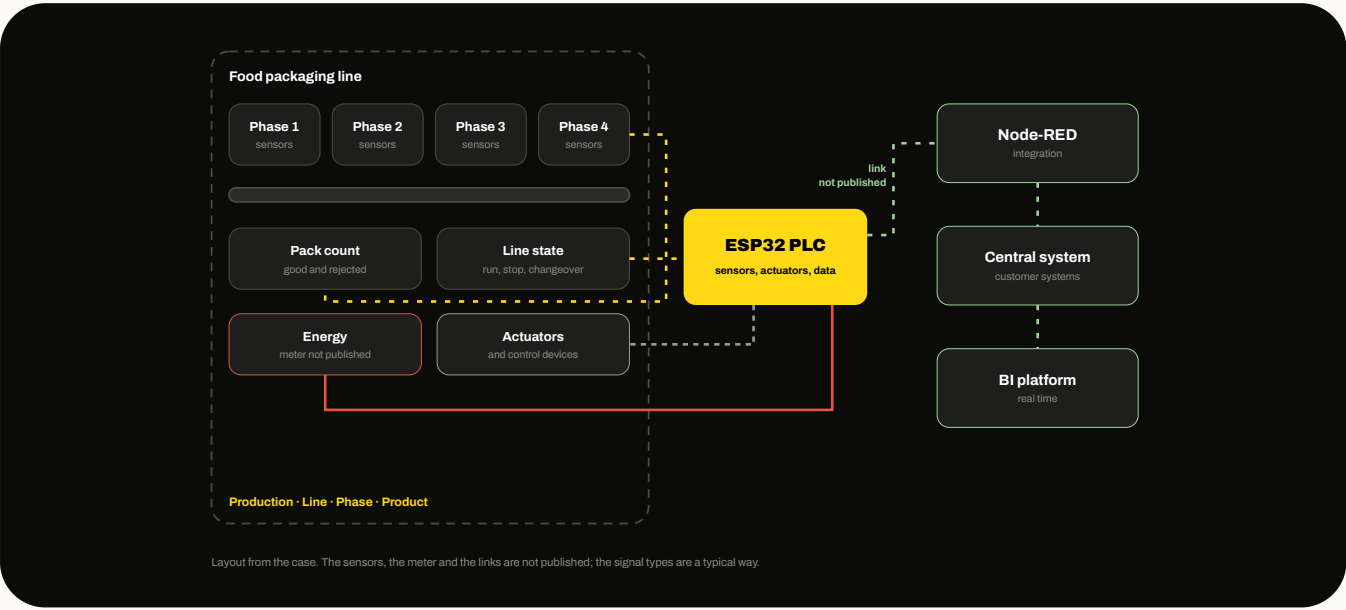
From the PLC to BI, and back to the plan.

Most of the data is now digital and available in real time. It goes to the central system and into a BI (Business Intelligence) platform. With a view product by product, the team can anticipate much more precisely how long a batch will take.

- Real-time data to the central system
- BI view of lines, products and incidents
- Batch times from measured rates

How do you retrofit a packaging line for data?

Keep the line and add industrial controllers. In this case the ESP32 PLC works with sensors, actuators and control devices of the line. It reads specific sensors for production data and sensors by phase or machine. Node-RED links the data with the customer's systems, and the central system feeds a BI platform in real time. The case does not publish the sensors, the energy meter, the network link or where Node-RED runs.



ESP32 PLC and field signals Data to other systems Energy Control of the line

Signals and data

Signal	Between	Type	Purpose
Pack count	Line sensors → ESP32 PLC	Digital inputs (typical)	Good and rejected packs for OEE
Line state	Line and machines → ESP32 PLC	Digital inputs (typical)	Running, stop and changeover times
Phase or machine sensors	Each phase → ESP32 PLC	Sensor signals (not published)	Stops and incidents by phase
Energy consumption	Line, machine or phase → ESP32 PLC	Meter (type not published)	Energy cost by line, machine or phase
Product and shift	Production order → data record	Data (source not published)	Yields by shift and incidents by product
Actuators and control devices	ESP32 PLC ↔ line	Outputs and devices (not detailed)	Control of the line
Line data	ESP32 PLC → Node-RED	Network link (not published)	Integration with other systems
Real-time data	Central system → BI platform	Data (format not published)	Lines, products, speeds, deviations, incidents, breakdowns and stops

The controller of the retrofit.



ESP32 PLC

Industrial controllers built on the dual core ESP32, for your DIN rail. On this line the ESP32 PLC works with the sensors, actuators and control devices, and shares the data with the customer's systems.

Role in this case	Reads the line and its phases, works with actuators and control devices, shares the data
Processor	ESP32 dual core, up to 240 MHz
Network	Ethernet 10/100, Wi-Fi 2.4 GHz, Bluetooth LE
Serial and buses	RS-485, RS-232, I2C, SPI
Programming	C++ with the Arduino IDE
Family	ESP32 PLC 14, 19R, 21, 38AR, 38R, 42, 57R and 58; up to 127 expansion modules over I2C

The case does not publish which ESP32 PLC model the line uses, or how many units. The source PDF shows a photo of an ESP32 PLC 21+, and the image here shows the ESP32 PLC 21 FLEX, its current version.

[See the ESP32 PLC family ›](#)

Sensors where the losses happen

The case added specific sensors on the PLC for production data and sensors by phase or machine. That is what shows which product and which phase cause the stops.

Open tools for integration

The case says that a PLC based on open source made integration with other systems easy. Node-RED and the Arduino IDE provided that ease of integration.

Room to grow

The project chose a modular solution, so the specifications can be expanded later. The ESP32 PLC family goes from 14 to 58 I/O and connects expansion modules over I2C.

UPGRADING A MACHINE OR A LINE?

Tell us what the line does today. An engineer will answer.

Tell us the machine, the control it has now, the signals you can reach and where the data must go: SCADA, ERP or BI. We will propose the PLC, the sensors and the integration.

READ IT ONLINE

industrialshields.com/case-study-packaging-line-retrofit-esp32-plc

EMAIL

info@industrialshields.com

PHONE

[\(+34\) 938 760 191](tel:+34938760191)