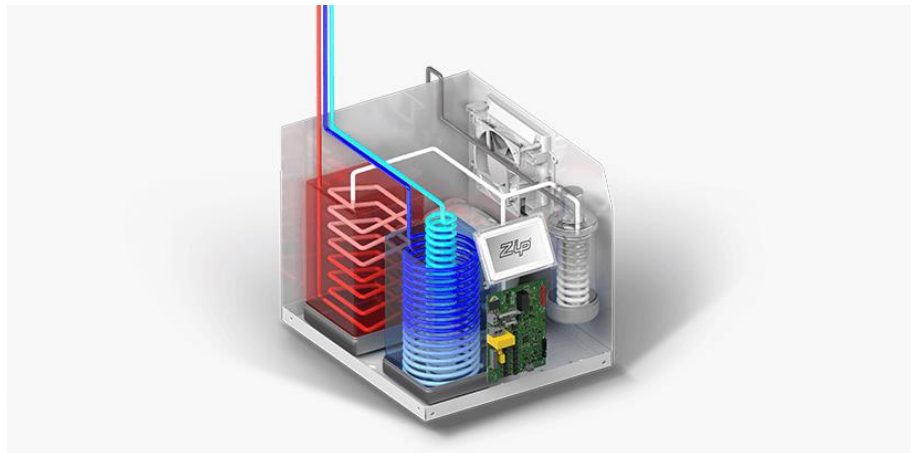


Case Study: Zip HydroTap Production Line



The Challenge

Zip Industries is an iconic Australian manufacturer of instant boiling water products. Their flagship product, the Zip HydroTap, is found in workplaces and kitchens around the world, and consists of a compact and energy efficient product that can dispense boiling, chilled and sparkling water through a single tap.



Zip Tap and HydroTap unit

With increased demand, and a desire to keep production based locally, Zip Industries recently underwent an ambitious upgrade to its production facilities. This upgrade aimed to improve throughput and quality using automation and Industry 4.0 best practises.

SoftWire Systems was engaged by Zip Industries for development of its specialised production line equipment, as well as a cloud based automated shop floor data collection system integrated with an existing Pronto Enterprise Resource Planning (ERP) system.

The Solution

The new HydroTap Conveyor line at Zip Industries consists of the following components which combine to deliver a world class solution.

- Conveyor System for transporting assembled products
- Assembly Stations for assembly processes
- **Electrical and Air Leak Test Stations ***
- **Functional Test Stations ***
- Gas Charging Stations
- **Production Serialisation Stations**
- **Label Printing Stations ***
- **Rework Stations ***
- **Shop Floor Production System ***

** Designed and developed by SoftWire Systems.*

Items in asterisks were designed and developed by SoftWire Systems, other components were integrated by SoftWire Systems' engineers during commissioning.



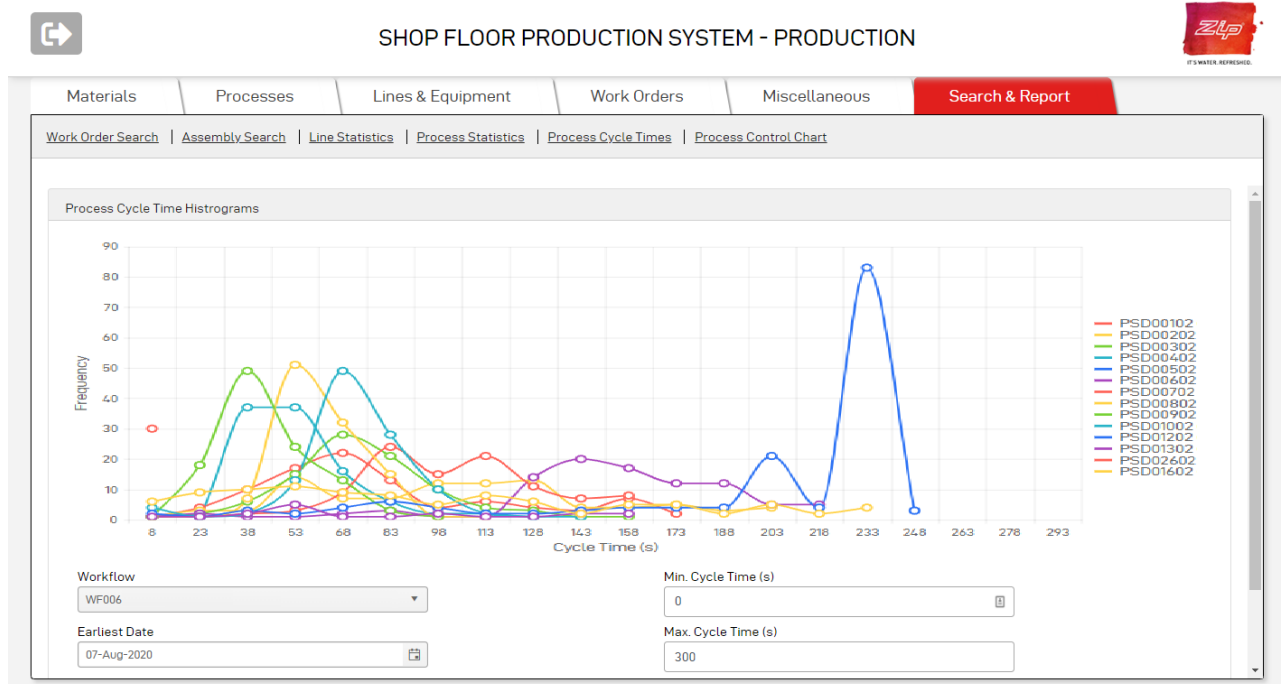
Zip HydroTap Production Line

Conveyor System

A conveyor system, designed and installed by Pharma Tech Systems, is used to transfer HydroTaps between assembly stations. For some stations, secondary conveyors are used to allow for line balancing and to reduce interruptions. An Omron control system monitored status of all palettes on the conveyors and the state at each station.

Shop Floor Production System (SFPS)

SoftWire Systems developed the Shop Floor Production System (SFPS) for Zip Industries to handle the data management of products, processes and equipment. This system connects to shop floor production equipment using Web Services, collecting detailed production records and integrating with backend ERP systems.



SFPS Portal

Hosted in the Microsoft Azure cloud platform, the SFPS consists of webservice for integrating with shopfloor equipment, serverless function apps for orchestration of data, an Azure SQL Database for storage of production records, and a web application for data entry and reporting. A custom-designed portal allows administrators and engineers to configure workflows and job orders from the comfort of their office, while shop floor equipment interacts with the SFPS for all process. This interaction includes retrieval of work instructions and process recipe information, as well as transmitting production data and test results.

The core services are hosted in the Microsoft Azure cloud platform, offering the following benefits:

- High availability and security
- Low ongoing maintenance
- Low cost of ownership
- Ability to scale up or down to meet capacity demands
- Ability to capture data from multiple manufacturing facilities in different geographic regions
- Single sign on with customers' existing directory services
- Access to Microsoft Azure platform services including reporting and advanced analytics

Assembly Stations

Touchscreen applications installed at each station display work instructions and other process information. These applications were developed in LabVIEW and use JSON messaging to communicate with the SFPS, and EthernetIP to communicate with the Conveyor PLC.

These applications were designed by SoftWire Systems to require minimal interaction by the operator, whose primary focus is to perform the assembly step (as per the work instructions). All SFPS and PLC transactions are recorded in log files, and all JSON documents are saved locally for review.



CHASSIS ATTACH STATION

Equipment ID: EQID-E001 Process Segment Definition: PSD000023-2 Process Segment Class: Chassis Attach

Serial Number: 9319731006498 P/C State: Returning DUT Test Result: **PASS**

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STANDARD OPERATING PROCEDURE

SOP NO: SWP111 SOP TITLE: BT G4 BC COMMERCIAL ASSEMBLY INSTRUCTION STATION NO: 10

SAFETY: 

Step	Description
20	Connect 22 Black and Black loom labelled as "Steer NTC" to overhead NTC (White and White) loom.
22	Connect 22 Blue and Black loom labelled as "Cold NTC" to chilled tank NTC (Blue, Black, Red) loom.
23	Connect 23 Blue and White loom labelled as "Cold Levels" to chilled tank cold level sensor (Blue and White) loom.
24	Connect 24 Black and Red loom labelled as "Hot NTC" to hot tank NTC (White and White) loom.
25	Connect 25 Red, Green, Yellow loom labelled as "Hot Levels" to hot tank hot level sensor (Red, Green, Yellow) loom.
26	Connect 26 Black, Red, Yellow loom labelled as "Flow Sensor" to flow sensor on flow track (Yellow and Black) loom.
27	Connect 27 Black and White loom labelled as "Cold NTC" to overhead NTC (Black and Red) loom.

F. Perform IACQ loom wiring as above.
 Follow the labels for correct wiring connections.



G. Connect 28 loom (28) to Star-Rush assembly (28) from one side and PCB board from the other.

Test Stations

Test Stations were designed and developed by SoftWire Systems, using the NI CompactRIO platform. A LabVIEW based test sequencer is able to step through individual tests, to ensure that production parameters are within limits. As with the Assembly Stations, these applications require tight integration with both the SFPS and the Conveyor PLC.

The Electrical and Air Leak Station includes a system air leak test, before specific electrical tests were performed using a GW Instek Hi Pot Tester and a Yokogawa Power meter.

The Functional Test Station included boiling and chiller calibration as well as confirming the operation of all sensors and valves. Basler cameras and NI Vision tools are used to measure the water clarity as one of the final tests.



Electrical Test Station

For the main production line, two Electrical Test and four Functional Test stations were deployed in order to satisfy the cycle time requirements for the production line. Additional rework stations were developed for testing units off the main conveyor line.

Other Stations

Similar applications are used for interaction with barcode printers at the start and end of the line, and a further application was designed for communications with refrigerant charging stations, controlled by a Siemens PLC. The architecture used across the production line offers full flexibility for later upgrades to the line.



Refrigeration Charging Stations

Project Summary

As of 2020, the conveyor line is able to run production parts with higher throughput and greater flexibility. Through the use of the SFPS, engineers and operators are aligned in their production activities. Additional processes are planned to be integrated into the conveyor line, while the Shop Floor Production System is being rolled out across legacy lines at Zip Industries to take advantage of improved workflow management and data capture.

The new Zip Production Line has recently been announced as a finalist in the 2020 Australian Excellence Awards, winners will be announced in September 2020.

