INDUSTRY 4.0

Powered by Revolution Pi

APPLICATION EXAMPLES

REVOLUTION PI

Hardware

Revolution Pi is an open, modular and inexpensive industrial PC based on the established Raspberry Pi meeting the IEC 61131-2 standard. Equipped with Raspberry Pi Compute Module, the base module can, depending on requirements, be expanded seamlessly using appropriate I/O modules and fieldbus gateways.

BASE

RevPi Core

RevPi Core is the central processing unit of our modular system. Equipped with a quad-core processor with 1.2 GHz and 1 GByte RAM. The multi-core processor by Broadcom has enough power for complex tasks such as image processing. Installed in a DIN rail housing and powered by 24 VDC, RevPi Core already has USB, Ethernet and HDMI connections.

POWERED BY RASPBERRY PI

EXPANSION

RevPi DIO

The digital I/O module expands Revolution Pi by 14 digital inputs and 14 outputs. It features PWM and counter functionality. Special versions with only 16 inputs or 16 outputs are also available.

RevPi AIO

The analog I/O module expands your Revolution Pi system by 2 analog inputs, 2 analog outputs and 2 RTD channels.

RevPi Gates

Integrate Revolution Pi into an industrial network by using gateway expansion modules. Gateways for all major industrial networks such as PROFINET & PROFIBUS are available. Up to two gateway modules can be used per Revolution Pi system.

Software

Despite the fact that Revolution Pi is an open system on which everyone can install their own apps and software, we have tried to equip Revolution Pi with software and apps that cover most applications. The operating system used is a customized version of Raspbian Jessie, which includes a real-time patch of the kernel. This is in our view the best compromise to stay as close as possible to the original development environment of a Raspberry Pi and still get a high level of control over the priorities of the tasks managed by the scheduler.

PiCtory

Every Revolution Pi system comes with PiCtory, a browser-based configuration software. The software enables you to define the positioning of hardware modules and the symbolic names of the input and output signals. Furthermore, PiCtory can also be used to configure connected hardware modules or installed drivers.

logi.CAD 3

logi.CAD 3 is the engineering software for creating control applications meeting IEC 61131-3 for Revolution Pi. Special adaptions of the Logi.RTS runtime system for RevPi Core turn the Rasbperry Pi Compute Module into a SPS mini controller for industrial applications.

PROCON-WEB IoT

PROCON-WEB IoT is a highly professional HMI software which can visualise data from the process image via a browser-based interface. In the opposite direction, data can also be written in the process image via the browser to, for instance, remotely adjust setpoints .

Cloud Services

Revolution Pi can easily be connected to Cloud services. Wether Cloud storage provided by external companies such as AWS or your own Cloud, thanks to an open and flexible API, the connection can be done in no time at all.

Modbus

Revolution Pi comes with master and slave capability for the popular Modbus RTU and Modbus TCP network protocols. The destination and intervals for communication with the Modbus protocol are freely configurable. The configuration is done via the browser-based, graphical configuration software PiCtory.

RevPi7

RevPi7 is the new S7 software interface running on our RevPi Core that can be used with all S7 devices which have a PN connectivity. It consists of a virtual master and a slave module which can be configured by PiCtory.

TeamViewer

By means of software agent that is activated at the start, TeamViewer users can now also reach and remotely control their RevPi Core devices via the internet. It is made possible by means of a very secure and user-friendly TeamViewer technology to access the RevPi Core webserver via a browser window. Available therefore are all functions that can be processed via the server and the ones offering a browser.

Setup and implementation

Implementation effort is one of the most significant parameters when realizing a project. Especially interface problems arising inevitably from the interaction of different systems are a major challenge. In addition, training times of the programmers in unknown libraries or APIs also cost valuable development time.

Revolution Pi makes it as easy as possible for users to implement it into their existing systems:

- Because of its proximity to Raspberry Pi, there are already countless and wide-spread libraries and programming interfaces that can be used for Revolution Pi.
- Revolution Pi does not contain any artificial restrictions that would impede programming: Access to the Linux operating system is allowed with full user rights, the source code of the Revolution Pi kernel driver is public and can be customized and even a complete replacement of the operating system is possible.
- A large selection of available programming languages and protocols. Whether Python, Node-RED or classic programming in C; wether MQTT, OPC UA, REST or MODBUS: Revolution Pi allows users to program and configure with widespread know-how.
- A support forum within the Revolution Pi community providing qualified answers and assistance – 24/7 online technical support with an average response time of less than 4 hours. The world never sleeps!

The outcome is not a theory, but a reality already experienced in practice by many customers:

A significant reduced time to market!

Application example

AMAZON WEB SERVICES (AWS)

A customer of AWS wants to use Revolution Pi to get his data into the AWS cloud. AWS shall develop a prototype in order to prove that this can be done in a cost-efficient and hassle-free way. AWS purchases a RevPi Core, RevPi DIO, RevPi AIO, as well as typical industrial sensors (PT100, distance sensor, control buttons), actuators (solenoid valve, traffic light) and a power supply unit.

The implementation was done within three days:

DAY I

A programmer from AWS had already set up the existing IoT runtime system "Greengrass" which was originally written for Raspberry Pi. Now, all he has to do is to gain access to the process data of Revolution Pi via its API and transfer it to Greengrass with a piece of software. In just one day, he familiarizes himself with the Revolution Pi and API using easy-to-understand video and text tutorials. Remaining questions regarding the data transfer are answered by members of the Revolution Pi support forum.

DAY II

On the second day, he copies his existing IoT runtime system to the RevPi Core and writes a small Python program to transfer process data to the runtime system via the API. The Greengrass software handles the entire connection setup and communication with the cloud.

DAY III

During testing, he discovers that the Linux kernel of the RevPi Core unfortunately has a different setup from the one needed for Greengrass. Since all the necessary files for compiling your own kernel are available on Github, he has an executable system after another four hours of work and can present a fully functional prototype to the customer.

Revolution Pi is the platform for new

the foundation for


, innovative business models -
the fourth industrial revolution!
REVOLUTION PI

RETROFIT - IIoT gateway

Monitoring and consumption recording of fresh water filling stations for rail vehicles.

ISSUE

There is a large discrepancy between the forecasted and billed fresh water consumption. It is assumed that the additional consumption is caused by leaks in certain pipes, theft and incorrect handling of the filling stations.

REQUEST

Each filling station shall be equipped with sensors and its data collected and analyzed in a central location.

The existing control and signalling devices of the filling station need to be equipped with a personal access control system so that only authorised personnel can operate the station.

IMPLEMENTATION

The existing Siemens PLC of the filling station will be enhanced by a Revolution Pi system. Thanks to RevPi7, Revolution Pi can communicate directly with the Siemens PLC.

Suitable flow sensors are installed at the individual filling points to record water consumption. These sensors are connected via the Revolution Pi I/O modules.

The measured consumption data is collected by Revolution Pi, processed and forwarded to an existing central ERP system via a connected GSM DIN rail module. The consumption values are stored there for later billing.

The Revolution Pi system is connected to an RFID reader via Modbus. This creates not only effective access control, but also allocates fresh water consumption to individual users.

The consumption data is sent to an AWS cloud and evaluated using algorithms. Anomalies in consumption, such as those caused by leakage or unauthorised consumption, can be quickly detected and rectified.

REQUIRED COMPONENTS

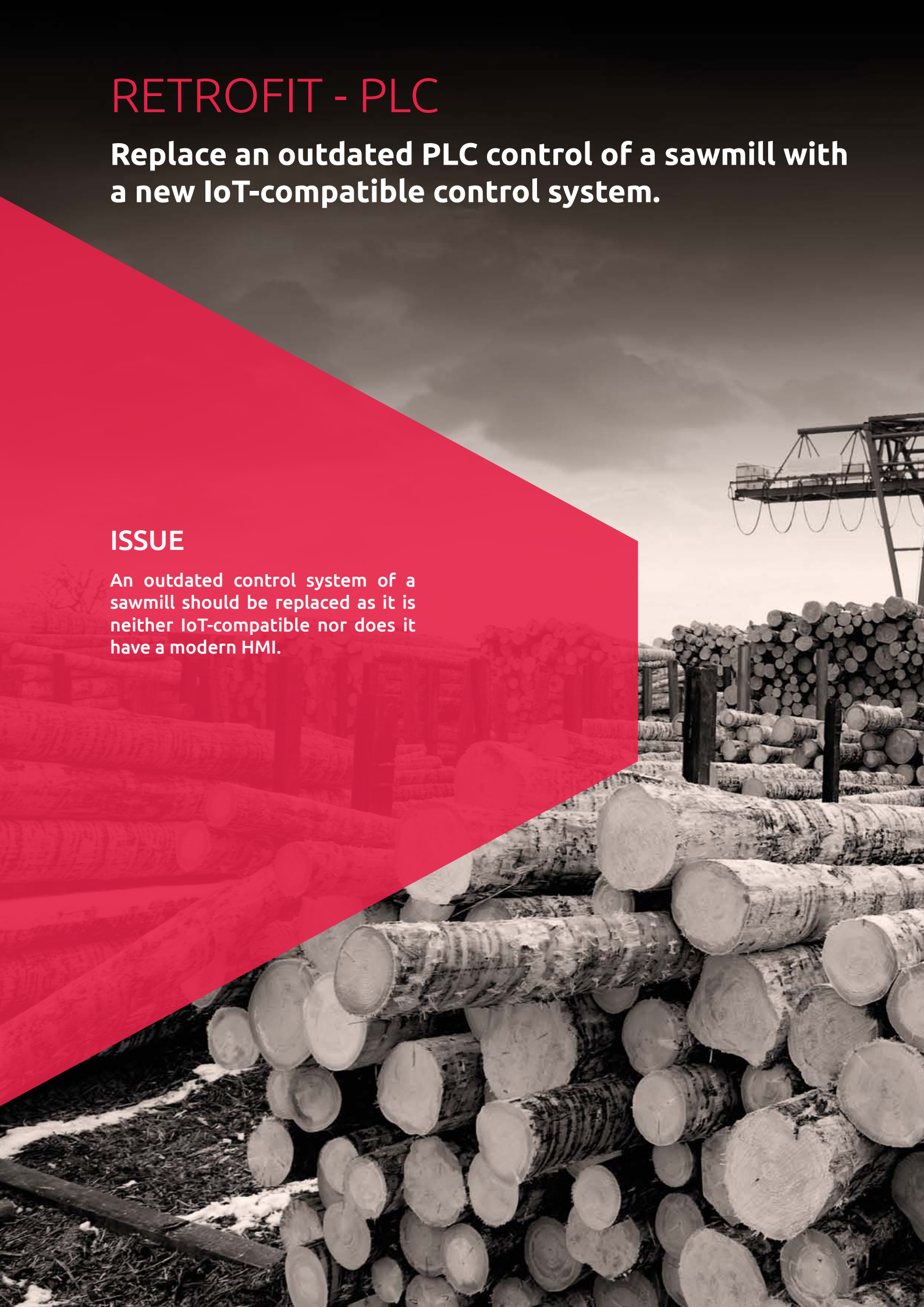
- RevPi Core
- RevPi DIO
- DIN rail GSM module
- Flowmeter
- AWS Cloud
- Modbus RFID Reader
- DIN rail Switch

RETROFIT - PLC

Replace an outdated PLC control of a sawmill with a new IoT-compatible control system.

ISSUE

An outdated control system of a sawmill should be replaced as it is neither IoT-compatible nor does it have a modern HMI.



REQUEST

A new control system featuring a graphical user interface (HMI) to make operation more efficient and safer.

Additional sensors should monitor the wear of the saw blade to prevent quality losses.

IMPLEMENTATION

The existing PLC operating with Modbus protocol is completely replaced by a Revolution Pi system.

Revolution Pi offers with logi.CAD 3 a Soft-PLC that supports Structured Text and FBD-programming. The existing PLC programs are easily ported to the new control system.

Modbus protocol can still be used because Revolution Pi can operate as a Modbus master without an additional gateway.

The existing sensors and actuators of the machine are connected to the digital & analog I/O modules of the Revolution Pi.

The HMI is realized using the browser-based PROCON-WEB IoT software.

The high-resolution visualizations and intuitive control elements of the new HMI minimise operator errors, thus increasing quality and reducing costs.

In addition to the HMI which is directly displayed and controlled on the machine via an HDMI touch panel, a modified version with limited permissions is provided for a desktop PC in the office.

A additional inexpensive USB camera in combination with a open source image analysis software (OpenCV) now monitors the cutting edges of the logs. Frayed out cuts that indicate wear of the saw blade are detected immediately. If this happens, Revolution Pi sends a push message directly to the responsible employee, who will inspect the saw blade and replace it if necessary.

REQUIRED COMPONENTS

- RevPi Core
- RevPi DIO
- logi.CAD 3
- PROCON-WEB IoT HMI
- HDMI touch panel

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