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Industrial Security

By the increasing networking of industrial plants the productivity is increased. However, also IT security risks arise which it is necessary to meet with corresponding protective measures for Industrial Security. A holistic view is necessary which takes similarly into account technical measures and contains the training of employees and the definition of guidelines and processes. This is necessary to attain the highest possible level of security and to ensure the safe operation of the plant. You find further information about technical solutions and our service offer for Industrial Security on the Internet under

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Caution

The functions and solutions described in this article confine themselves to the realization of the automation task predominantly.
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SIEMENS

SIMATIC
PROFIenergy

Application of PROFINET profile PROFIenergy

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1 Automation Task

1.1 Overview

Introduction

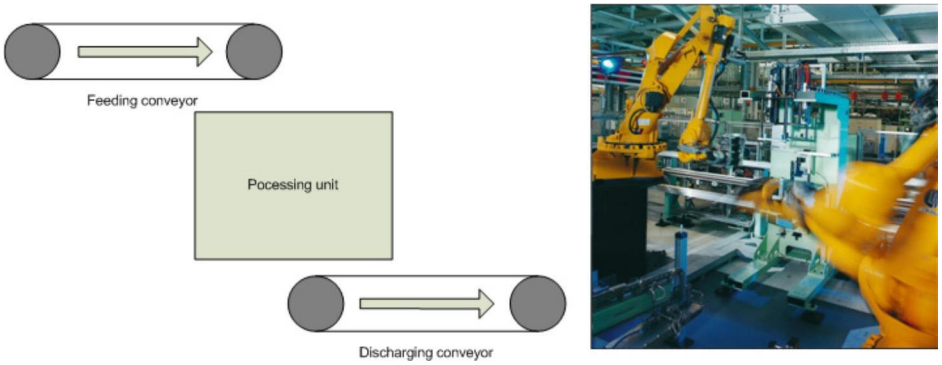
The importance of energy management will grow in the future. To cut costs by saving energy in the production is an approach that has been used for quite some time already. Recently, short production-free times become center of the focus - from short pauses up to shifts off work.
Main switch turned off - the complete production stops and the lights in the hall go out. This is the common way in nearly each plant all over the world in production free times like weekends or during plant vacation shutdown. But what happens during shorter pauses? Here, the plant proceeds and consumes energy without delivering productive results.
Is it not possible to put smaller units of the plant that are not needed over a certain period of time into an energy saving mode while the rest of the plant keeps on producing?
All this might considerably improve the energy balance of a production unit.

The currently used technology which isolates the production components from the mains via one or more main switches is inappropriate for that purpose as it deactivates production units in an undifferentiated way. Hard-wired switching paths for firmly defined production units are not flexible enough to make the grade concerning energy efficiency.
The decision for PROFINET already lays the foundations for a new and future oriented energy management.
Future-oriented energy management means: Units are no longer switched off via the conventional method which uses the main switch, but in a better defined way via the network!
In doing so, the general power supply of the components remains activated and the components enter a defined energy-saving state - initiated by a command.
PROFIenergy is a protocol defined by the PROFINET user organization which provides the prerequisites for a vendor-independent system that can be generally used to switch off individual consumers or complete production units in a flexible and intelligent way on a short-term base.
SIEMENS already supports PROFIenergy /1/ with first implementations into the automation system SIMATIC.
The following application shows step by step how such an application can be realized using the ET 200S with integrated PROFIenergy functionality.

Overview of the automation task

The figure below provides an overview of the automation task.

Figure 1-1

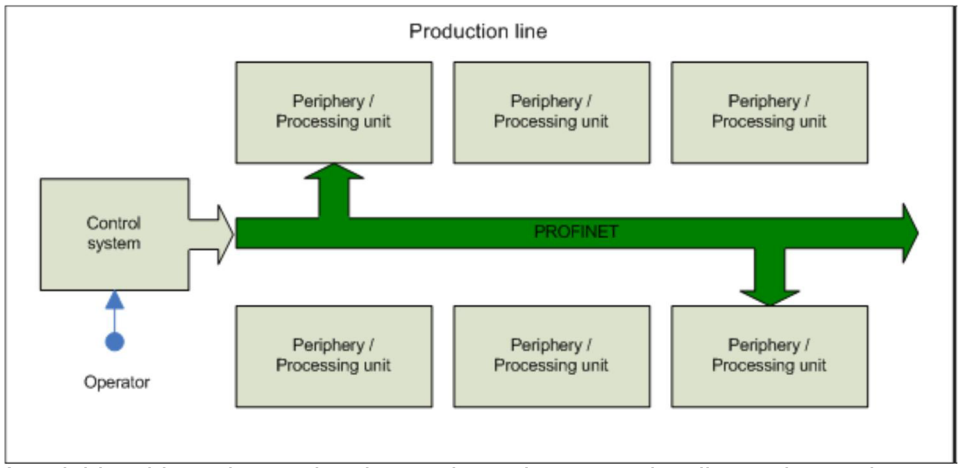


This application describes the switch-off of automation components using an example from production - here a production line with robots.
This plant consists of one feeding and one discharging conveyor belt and a processing unit. The belts are connected to an ET 200S; each with an own PROFIenergy-enabled power module. For reasons of clarification the processing unit is a "black box" that is switched on/off via an own ET 200S.
In terms of energy saving the PROFIenergy does not focus on the drive motors since these are switched off in case of a production stop. It rather concentrates on the numerous sensors and further electronic components.

Description of the automation task

During a pause the components of the automation component shall be switched off. The spontaneous or regularly planned pause can be initiated by the user via the control system. After the production has stopped parts of the decentral periphery are switched off via applicable PROFIenergy commands. Before the production is started again the necessary automation components are switched on again.

Figure 1-2



A variable table and an optional control panel serve to visualize and control.

1.2 Scenarios

Requirements of the automation task

This application example shall present the following switch-on and switch-off scenarios.

Table 1-1

Problem description	Explanation
Switch off all the plant components	If no staggered switch-off is required; which means that all parts are switched off at once
Switch off individual plant components	Staggered switch-off Coordinated shut-down, i.e. necessary because of the technological process
Switch on individual plant components	Staggered switch-on
Switch on all / remaining plant components	Components of the plant, which are not subject to a special switch-on sequence.

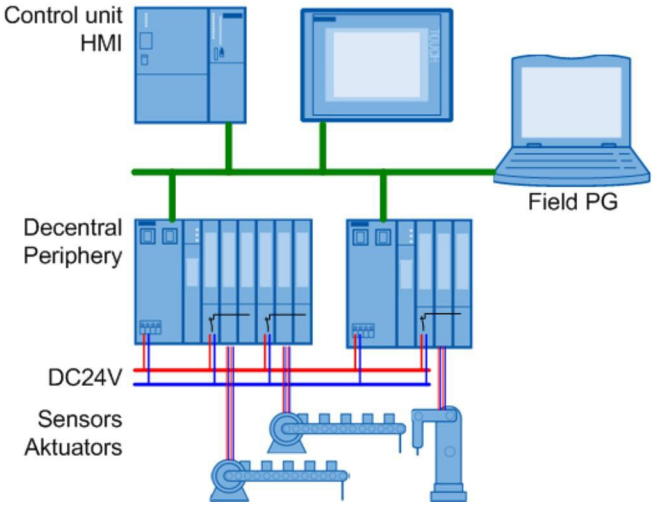
2 Automation Solution

2.1 Overview of the overall solution

Layout

The following figure shows the most important components of the solution:

Figure 2-1



Structure

The plant described above is based in a decentralized design. Via two ET 200S with several I/O groups (load groups) each, the CPU controls the plant.
PROFIenergy enabled power modules separate the I/O groups. The respective I/O modules have to supply the sensors and actuators with voltage to achieve appropriate energy savings. The energy is saved by switching off the supply voltage via the power modules.
A direct supply of the sensors and actuators via a "24V bus" would impede a selective switch-off and by that the saving of energy.
Input / visualization via HMI are offered as an option. The same information and input fields are available in a variable table. The panel itself can also be simulated on the PG via WinCC flexible Runtime.

Topics not covered by this application

This application does not include a description of the meta knowledge required to shut down the plant in an orderly manner. Since this knowledge is plant/ machine specific it cannot be covered in this document.

For the same reason there is no staggered switch-off of the components with PROFIenergy.
Hereafter, the basic functionality of the PROFIenergy protocol and the respective function blocks for SIMATIC will be explained.

Required knowledge

It is assumed that the user has basic knowledge in automation, SIMATIC, PROFINET and project planning with STEP 7.

2.2 Description of the core functionality

Overview of the basic functionality

The block follows the shown schematic and expects inputs into the UserDB, which will be described in greater detail later.

Figure 2-2