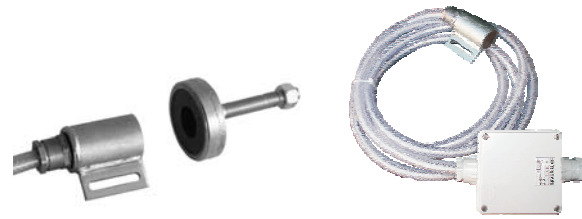


## Basic sensors for automated conveyor check and control

**Rpm sensor** - is necessary to check the motion of the belt. The control system has the information about the conveyor movement and it monitors its rated speed. If the speed is lowered, slipping will be evaluated and the conveyor or the whole line can be stopped. If the belt stops while the drive is running, it can wear through and roll and may cause fire. Repair costs can be very high and even the structure may be damaged.

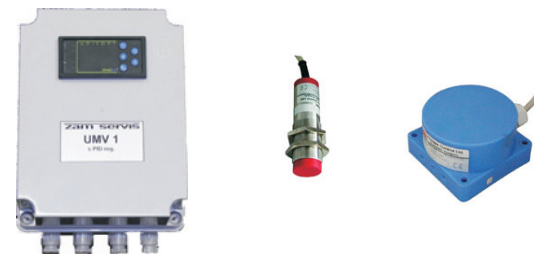


### Theft protection of conveyor paths

The most interesting application for theft protection is the use of camera system. Parts of the conveyor paths can be monitored by cameras in operation as well as when they are switched off. The signal can be transferred over long distance to the security guard room, where records can be made. The images from the cameras can also be used by the software for operation visualization. The whole operation can be monitored as well. Under certain conditions the display image can be transferred to the Internet and it can be available for your own use after a password is entered.



**Transfer sensor** - one of the greatest problems of belt transport. When the material is transported, a greater amount can pile up, causing a break at the transfer point. This break may retard the following conveyor as well as the conveyor pouring the material to the transfer point. The break can be caused by the type of transported material or by unsuitable transfer point construction. The type of the transfer point sensor depends on the construction of the transfer point and on the type of transported material.



**Aberration sensor** - it is used mostly with long conveyor lines and detects the deflection of the belt off its path. The deflection may be caused by an improperly loaded conveyor with the material on one side, by a defect, etc. The sensors are mounted if required and if such failures are expectable.



The camera system also works in an automatic mode and it can monitor movement. First, watch windows are created; if the image in the given window changes, the system will activate the alarm signal. This function can be used as supplementary protection of no entrance zones of conveyor paths in operation. If any movement of persons is detected in such zone, the system will activate alarm and the path can be switched off by means of the input from the system. You can combine the camera system with data transfer depending on the total area of the plant, result expectations and investment possibilities. The picture shows an image from the camera with highlighted watch windows. The red area is ignored. Recording and transferring proceed without this marking.

The catalogue sheet contains only some parameters important for your decision. For planning always require a corresponding user manual and eventually a technical consultation on the possibilities of use.

## Why automation and where you should begin

### Description:

The wiring system in older technologies without automation is very often in a bad state of repair. The distribution board equipment from the 50's-70's of the last century is mostly obsolete. The components were manufactured and connected according to standards valid at that time and they mostly do not conform to today's regulations. As a rule there is no current documentation and/or no necessary repairs have been made after reconstructions, adaptations or connection modifications. It is then necessary to rely on service workers' experience only. There is usually only one person available and thus a minor defect of the wiring system may cause a long stoppage if this worker is not present at the moment.

When conveyor paths are switched on, the command button "operation" is usually pressed manually without any possibility of automated control of all devices being started. Therefore it is necessary to check all devices visually during a round. However, some faults cannot be found in this way and will not become evident until the start-up or full operation.

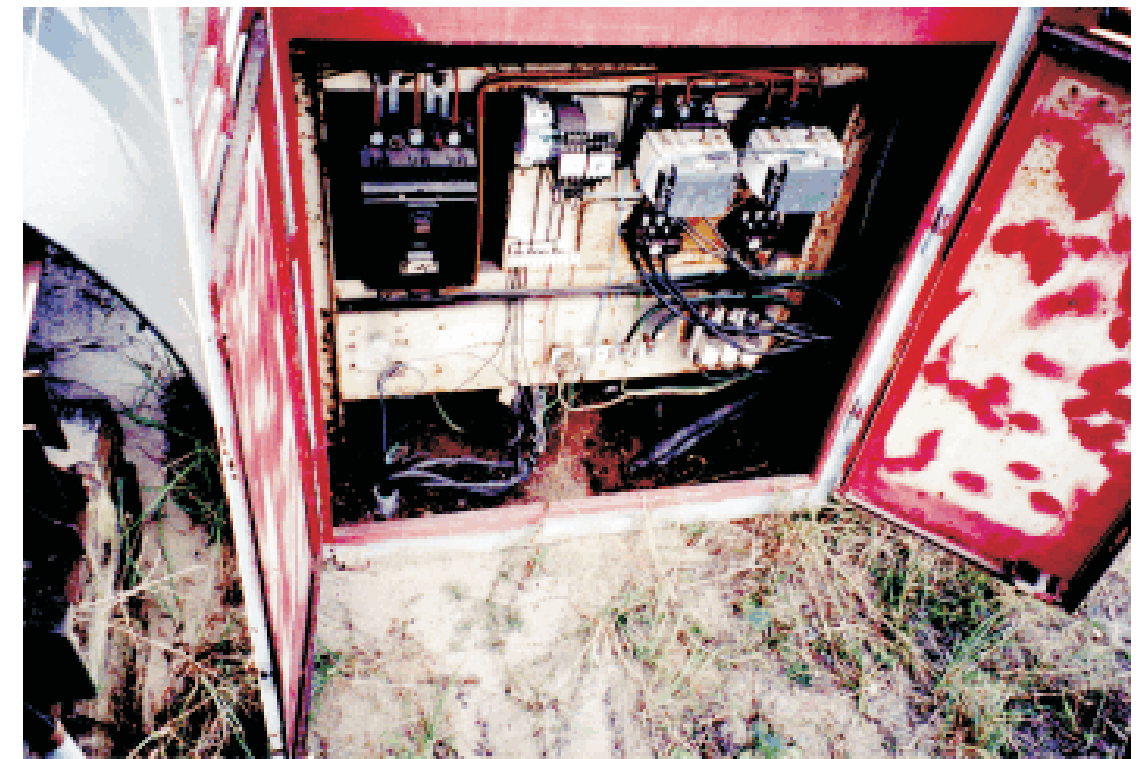
### Not like that!

Very often there is no acoustic or optical start-up signalling; the worst situation comes with a conveyor emergency stop there is often only one possibility with a button at the distribution board, because pull-wire stop control switches are usually original, obsolete, rusted, functionless or there are none at all. Conveyor operation under such conditions is very hazardous and there are dangers of accidents with the most serious consequences.

Of course not all of the old electrical distributions of technologies are in such a bad state. Frequent and careful maintenance will ensure acceptable condition and safety is provided at least at the former standard level (exceptionally according to current standards).

A large number of control elements and cables are still used for starting up and control. The logic is comprised of a lot of relays. If any fault occurs, it is very difficult to find the cause even if the distribution is well maintained and the reparation requires an experienced electrician who knows all trouble causes.

All these problems can be removed by automation applied to the whole plant and especially by using the **RDP 444 automation units** for conveyor transport.

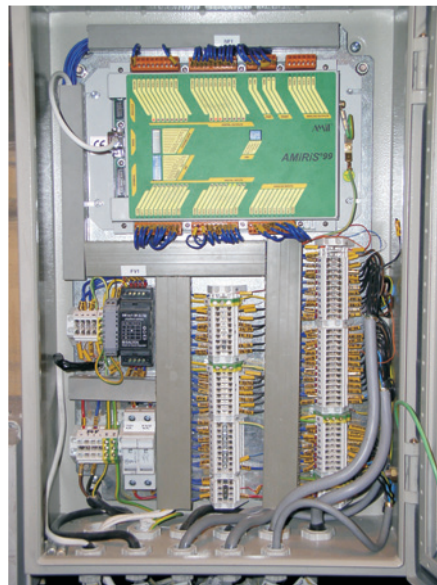


## Why automation and where you should begin

### Imagine that:

- you know the condition of all devices prior to the conveyor start-up power supply, sensor function, flap positions and adjusted paths;
- prior to starting up the conveyor line the workers are alerted to the start-up by acoustic and light signals and they have sufficient time to leave the area where they could be endangered or they can block the start-up from any position if there are any unusual conditions;
- a collision occurs during operation, e.g. a break at the transfer point. The relevant conveyors will stop automatically and the staff in the control room will know immediately what happened and where. Where continuous material feed is necessary, the automatics will provide a reserve conveyor line adjustment and start-up.
- the staff in the control room can respond to a reported failure immediately and call a service technician, e.g. an electrician, to remove it.
- you can monitor your plan fulfillment via a computer network or Internet;
- you can save cabling and cabling maintenance costs;
- you can make your production or mining more efficient without growing energy costs of idle running technology;
- you can simplify the logical linking of the devices and centralize this information in one place in the control room using a simple thin cable;
- you can save even more our staff will show you how in the specification.

### Like THAT!



### Where you should begin:

1. First, it is necessary to make a complete analysis of the present state, to specify goals, preferably with concrete values, and to elaborate a specification. We offer you expert assistance and our experience for this stage.
2. Another important step is to ensure the safety of the overall technology according to regulations in force. Possible dangers in terms of personal protection and protection of equipment must be assessed and described. You and your employees can do this best as you know your environment. Our staff can help by providing practical experience in forming safety rules. We also recommend you to consult specialists of accredited testing laboratories, such as FTZÚ Ostrava-Radvanice for Ex environments, if your technology is more complicated.
3. We will elaborate a detailed technical solution based on your specification and the safety rules. Suitable safety elements and sensors will be selected according to the environment and their use. We will suggest optimum arrangement of automation units according to drive range and parameters. We will add control systems for the remaining machines and we will describe the system. The result of this stage is the price quotation with a simple description of technology control.
4. The last step to the automation is your assessment of the quotation and the start of implementation.

We believe that the description of our control system on the following pages gives you an idea of automation possibilities, of our work and our processes, and that you invite us to solve the automation of your technology.

## Ensuring the safety of machines and conveyors

### Description:

Automation is based on the unmanned start-up of machines. A machine can mean a conveyor belt as well. To make this start-up possible, the control system must know the condition of the machine. In the case of manual start-up this function is made visually by machine staff. The control system must obtain information from sensors. Intentions of persons moving near the conveyor cannot be defined and the control system is not able to estimate their activity. For personal protection, safety elements such as emergency stop equipment, mechanical protections, etc. must be installed. To ensure protection of the plant it may be necessary to use sensors for object security in areas where safety and protection elements may be stolen from the machines, e.g. at long conveyor lines.

Machine safety is solved by many laws, standards and regulations. For manufacturers of new machinery namely:

- Law No. 22/1997 Technical requirements for products
  - Statutory order No. 169/1997 and from 1. 5. 2004 Statutory order No. 17/2003 on requirements for products in terms of electromagnetic compatibility
  - Statutory order No. 170/1997 and from 1. 5. 2004 Statutory order No. 24/2003 on machinery requirements
- The government issued the Statutory order No. 378/2001 (89/665/EEC) on minimum requirements for safe operation and use of machinery for current equipment users.

The most important ČSN EN machinery safety standards:

- ČSN EN 1050** Safety of Machinery Principles for risk assessment
- ČSN EN 954-1** Safety of Machinery Safety parts of control systems-Part 1: General construction principles
- ČSN EN 1037** Safety of Machinery Unexpected start-up prevention
- ČSN EN 418** Safety of Machinery Emergency stop equipment, Functionality points, Structural principles
- ČSN EN 60204-1** Safety of Machinery Electric machine equipment-Part 1: General requirements
- ČSN EN 60947-5-1** LV switchgear and controlgear-Part 5-1: Appliances and switching devices of control circuits-Electromechanical control circuit devices
- ČSN EN 60947-5-5** LV switchgear and controlgear-Part 5-5: Appliances and switching devices of control circuits-Devices for electric emergency stopping with mechanical securing
- ČSN EN ISO 12100-1** Safety of Machinery Basic terms, General construction principles-Part 1: Basic terminology
- ČSN EN ISO 12100-2** Safety of Machinery Basic terms, General construction principles-Part 2: Technical fundamentals

### Basic safety elements for conveyor transport

The basic safety elements are emergency stop devices:

- pull-wire emergency switch
- button emergency switch

The emergency stop devices must comply with requirements given by standards, namely ČSN EN 418, ČSN EN 60204-1, ČSN EN 60947-5-1, ČSN EN 60947-5-5, ČSN EN 954-1, ČSN EN 1037, ČSN EN ISO 12100-1, ČSN EN ISO 12100-2.

Basic requirements for an emergency switch:

- blocking (lock) of tripping mechanism after activation; unblocking can be made only manually; positive opening action
- the control element (pull-wire, button) must be red, the background must be yellow, the button must be palm shaped or mushroom shaped
- if the wire is torn or slips out, emergency stop signal must be called
- vertical draw force on the pull-wire, necessary for the emergency stop signal, must be smaller than 200 N
- vertical deflection of the pull-wire, necessary for the emergency stop signal, must be smaller than 400 mm

