

System of technological control installed in Mint of Finland

Radwag company in year 2007 has accepted order for realization a supervision and control system over the process of packaging and registering Euro coins manufactured by Mint of Finland.

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When stepping to the realization of the project, Mint of Finland has ordered many conditions that seemed difficult to design, but which were a must in that system:

1. adaptation of the system to existing technological lines.
2. integration of all controlling in one supervising point.
3. joining existing automatic systems and robots to the new system.
4. 100 % control of all manufactured coins by their quality and quantity.
5. total elimination of human factor from production process
6. introduction and installation of the system within a few days.
7. full identification of manufactured single packages with coins

Engineers of Radwag company together with workers from Mint of Finland have made several consultations, which resulted in preparation of a detailed algorithm of system operation.

Two modes of system operation have been accepted: automatic mode, fully controlled by computer, and manual mode, which is a so called emergency mode activated in case of failure of some part of the whole system.

Automatic mode has been divided into a series of modules operating independently, but being in cooperation with each other through application of computer system.

Initial control



The first step of control for manufactured coins is automatic checkweigher for dynamic checking of the packages with coins including from 200 to 400 coins, depending on their nominal value. The aim of scale is theoretically very simple: get the settings from computer, and control packages that go through the line. In case there is a defected package with lack of one or more coins, the checkweigher discriminates them from the line.

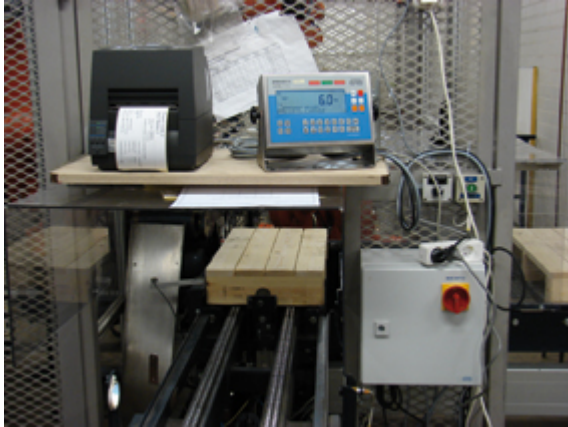
However, this is here, where the first problem appeared. One coin is different from another, i.e. two coins with the same nominal had not comparable masses. It is so due to the various density of metal which is source for the production of coins. The problem unimportant in case of comparing two single coins, became important while comparing whole package of coins. Unrepeatable mass of coins in the complete package made the package differ in mass more than one coin. In result defective package could be classified as correct one.

Radwag engineers have solved this problem by using dynamic control of reference mass during production process. In few words, it can be described as "intelligent" correction of reference mass in correct packages – scale controls potential increases of masses in correct packages and in case its necessary, it corrects reference points.

As the customer asked for full identification of manufactured coins, each correct package, as it is measured, is additionally automatically marked by ink jet printer. Customer chose ink jet printer, and not a label printer because of the

security provisions – each package has to be fully transparent for its final visual control. As soon as the package is measured by the scale, obtained data is automatically sent to a computer, where it is registered.

Final control



Packages, after weighing process are transported to the next technological stand, where they are controlled again, and packed onto pallets. This stage of technological process, due to the type of product, includes control procedure. The stand is fully separated, and additionally continuously monitored by system of cameras, so that there is no possibility of any manipulation on manufactured packages by unauthorized personnel.

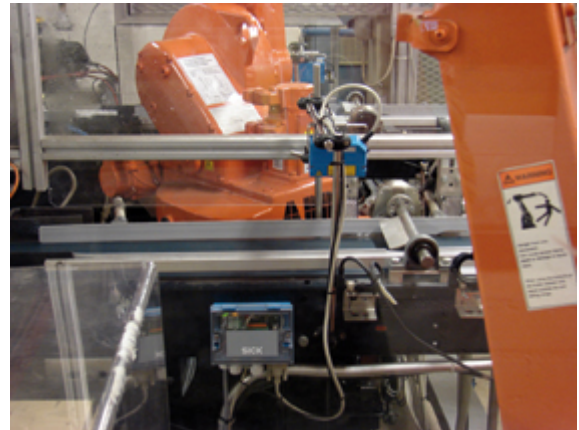
At first the package is identified by bar code reader. Computer checks if the controlled package has correct bar code. Than, if the code is correct, the computer sets signal to the industrial robot for packing the package onto a pallet. If there is an error, the package is discriminated for further control by the personnel.

The system is also fully protected against defected packages or such that were manipulated.

Firstly, the package is controlled by the bar code scanner.

Secondly, the industrial robot is checking the tightness of the package – it is capable of distinguishing package that is improperly wrapped into foil or damaged.

And third, packages are put onto pallet that is situated on a scale, which is also controlling increases of mass.



Process of putting the packages onto pallet is controlled by the computer, which sets signal for placing empty pallet on the scale, tarring it, and only than sending signal to robot for placing packages onto the empty pallet. As the package is placed, computer compares the mass with its reference in the data base and determines whether proper package was put on to the pallet. If there is any difference found, defect signal is activated, and system is waiting for the operators to react. Restoring system operation is possible only by authorized personnel.

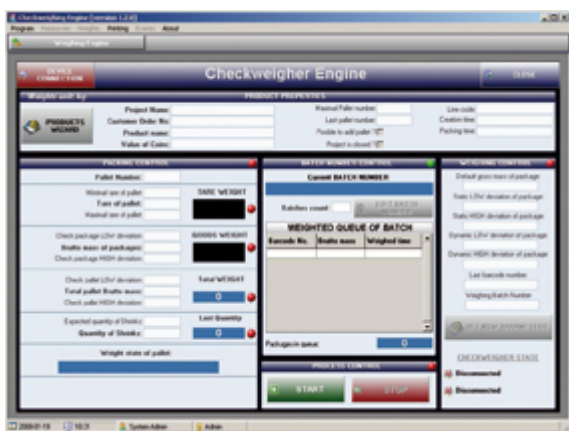


As complete pallet is packed, computer calculates expected total pallet mass, and again verifies it with current mass reading on the scale. if all the data is within set thresholds, than cumulative label is printed, and pallet is released from weighing stand. In case pallet's mass is incorrect, label with error indication is printed. It includes data necessary for verification of the error, and the pallet for forwarded for manual checking.

If manual mode is active, pallet scale is able to take over all controlling functions from the computer, with only difference being in setting the scale manually.



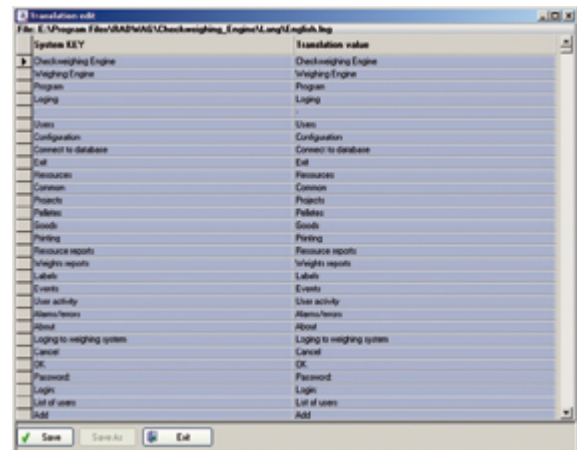
Computer system



As mentioned at the beginning, the system is to guarantee full identification of single packages and registration of whole production process. For realization of this functions, system has been equipped with fast and spacious data base SQL Server and set of controlling and supervising tools over production process. Computer software allows for optional configuration of process operating algorithm either on new project introduction stage, or its realization through elements of the system. Administrator can define all required parameters necessary for production start, such as: reference numbers, nominal masses, client data or person data for worker responsible for the project, or only some particular criteria of the project. Similar functionality refers to the defining operation of the control algorithm. The software allows for switching off for instance control of the bar code scanner or pallet scale, which in case of a defect does not stop the whole technological line. Additionally, the variables, like reference mass, deviations, codes, etc.) which are used by the system can be assigned to each project separately, globally or as connection of these two options. The software is equipped with list of options allowing for filtering of manufactured batches,

realized projects or quantity of manufactured coins of a specific nominal according to declared criteria.

Radwag software engineers did not forget about such detail as translating module, which helps in optional translation and replacement of all texts from the computer software..



Supervision over maintenance and service of the system has been taken over by Radwag Distributor in Finland, company Dosetec.

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