Engineering White Paper

GRADING SYSTEMS ON WEIGHT
PENKO ENGINEERING B.V.

INTRODUCTION

This White Paper discusses the challenges, options and solutions for process manufacturers when grading products, based on their specific mass, into more than one product category by example for the consumer and/or as a preparation for further processing.

PURPOSE OF WHITE PAPER

… is to explain why it is important to grade products into the right category. A grading system is automatic by its nature. Whether it is of industrial proportion or simply a small system on shop level, similar challenges regarding accurate grading apply which have a direct effect on cost and profit margins for the process manufacturer and/or the packer. The accuracy of grading directly influences the quality of the selection. In many occasions the price per product is dependent of its mass, so inaccurate grading results in profit loss and product spillage. Incorrect graded products moreover create unhappy customers and may even cause a bad reputation.
In addition to such losses, there is the added argumentation of international standards and legislations on grades for natural products such as fruit, vegetables and fish

BACKGROUND ON GRADING

Controllers for grading processes are designed to ensure the exact mass determination of every individual piece of product. Doing so lots of goods with similar weights are created. In fact these weighers have something in common with check weighers. The main difference is selection is not made on “good” or “wrong”, but on the grade. Each grade has its own bandwidth and its own pusher. The grading process is usually found where the product is prepared for the auction, the wholesaler or directly after receipt of the goods for further processing.

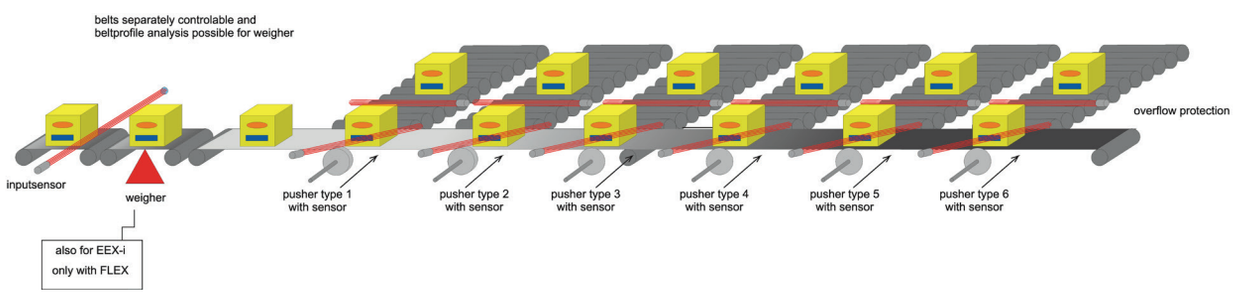

Figure 1, Example of grading in six classes of weight.

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Grading machines can be static or dynamic. In the latter case, the product is in motion during weighing for example on a conveyor belt. This will typically have an adverse effect on the weighing accuracy due to accelerations or de-accelerations and vibrations of the mechanical parts. Under such circumstances PENKO instruments excel because of their sophisticated state-of-the-art filtering processes. For registration and/or labelling purposes, PENKO offers specifically designed software.

Any single piece, or a lot of pieces, can be a quantity for trade. For external trade applications, legal requirement is obligatory. The worldwide OIML (International Organization for Legal Metrology) recommendation R51 outlines these rules for check weighers and R61 for mass filling instruments, while the MID (Measurements Instruments Directive) is Europe specific and the NIST Handbook 44, edition 2014, covering automatic check weighers and automatic gravimetric filling machines in chapter 2.24 is relevant to the United States. That's why the instruments are certified in confirmation with the European Directive MID and OIML-recommendations R51 for check weighers and R61 for gravimetric filling machines. Additionally such a system can automatically create an e-mark protocol for small packages, ≤ 10 kg.

For the detailed requirements for check weighers and automatic gravimetric filling equipment please ask for the applicable white papers.

Photo 1. Grading in a fish processing plant.

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GRADING SOLUTIONS; FREE PROGRAMMABLE

All Instruments:

- Independent on/off switching of 3 belts
- Stops the supply when interrupted
- Ease of operations with user friendly touch screen panel
- Variable belt speed control option
- Belt weigher input controls
- Grading within pre-programmed bandwidths
- Storage and/or printing of grading results per product selection

Photo 2. Grading in a fish processing plant.

Extras for FLEX:

- Numerous grading positions with push out per position
- Control of pusher in and out position

Photo 3. Grading in a fish processing plant.

Additional for multichannel FLEX:

- Connection to metal detector
- Control of up to four grading machines in one instrument

Photo 4. Lining up eggs before grading.

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COMPETITIVE ADVANTAGE

A high resolution filtering system combined with high speed – high accuracy measuring, offers smart weighing results for any operation environment.
All instruments are designed and manufactured with an accuracy of 10.000d. The combination of measuring at high speed (1600 conversions/s) with a high internal resolution (16.777.216), smart filters and sufficient computing capacity, makes the FLEX range suitable for any grading application. The combination of the high resolution and conversion speed guarantees the best achievable grading accuracy, even when conveying at high speed, and thus guarantees lots of similar product by preventing for incorrect selections.

PRODUCT SOLUTION

MODEL FLEX-2100

This three-in-one device combines a stunningly-simple touchscreen interface, a core of sophisticated hardware and a clever calibration system. It offers 8 inputs/8 outputs, an integrated PLC, communication via an Ethernet (TCP) portal with the protocols Modbus, FINS, Ethernet-IP and ASCII, portals RS232 and RS422/RS485 with the protocols Modbus and ASCII. Protocols for printers, webbrowsers and configuration software between PENKO-instruments are available on Ethernet (TCP), CAN, RS232/422 and USB.
Additional options are an analogue output and a portal Profibus with protocol Profibus-DP.

MODEL FLEX

This most versatile apparatus is an all-in-one compact, reliable and user friendly indicator/controller, suitable for automatic and non-automatic weighing.

The FLEX has an integrated PLC, offers an expandable number of inputs/outputs including remote I/O's; its communication portals include an Ethernet (TCP) portal with the protocols Modbus, FINS, Ethernet-IP and ASCII, portals RS232 and RS422/RS485 with the protocols Modbus and ASCII, as well as optionally a portal Profibus with protocol Profibus-DP. Protocols for printers, webbrowsers and configuration software between PENKO-instruments are available on Ethernet (TCP), CAN, RS232/422, and USB, making it highly suitable for complex weighing applications. Digital and analogue inputs/outputs are optional.
The FLEX range has all the features of model FLEX-2100.

MODEL FLEX MULTI-CHANNEL

This most versatile apparatus possesses all the features of the models FLEX and FLEX-2100 with additionally the capacity to control up to four weighing systems in one instrument simultaneously and, where necessary, cross linked.

CONCLUSION

PENKO instruments control the weighing system and grading application all in one. All PENKO systems are “Slave” systems.

Grading pieces of product to correct and specific weight classes while adhering to regulations in the shortest time possible and the most effective way, remains a challenge throughout the processing industry and will vary from one manufacturer to another. Consideration not only needs to be given to incorrect and inaccurate grading challenges, but each product – particularly natural products – has its own intrinsic weight and volume that influences the grading process.

To engineer the most efficient way per industry, per product, per manufacturer, there is no “one-size-fits-all” solution. Engineers at PENKO work out the best and most effective way this can be done.

Following White Papers will discuss Non Automatic Weighing Systems, Check Weighing Systems, Filling Systems, continuous totalizing with Loss-in-Weight and Belt Weighing, discontinuous totalizing with Hopper Weighers, and Batch Control on Weight for Mixing Plants.

For more information: www.penko.com