

# / Ensuring location flexibility

Reducing the cost of relocating production





## / Introduction

**A** ccording to a survey by the Association of German Chambers of Industry and Commerce (DIHK), a large number of German companies are planning to relocate production abroad<sup>1</sup>. Experts see the high labour costs in Germany as being one of the reasons for shifting part of production or for relocating entire production facilities. However, increasing globalisation and the need for an increased presence in these countries are also used as arguments. The (supposed) savings potential due to a relocation is accompanied by the costs for dismantling, transport and logistics, commissioning, validation and qualification at the new location. This white paper uses a pharmaceutical production plant as an example of how to significantly reduce commissioning costs by using special components – in this case Weigh Cells. In addition, the text provides planners and designers with indications of the advantages that AVC-assisted Weigh Cell technology may offer from a qualitative and quantitative point of view for machinery and systems whose operating locations are uncertain. ▲

## / Attractive for companies

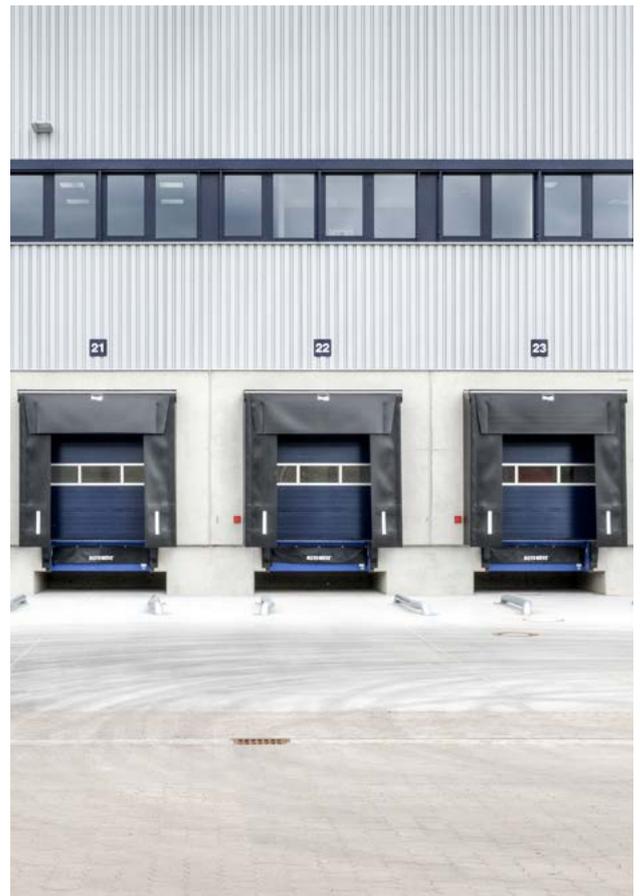


Using the development of the pharmaceutical industry as an example, the DIHK survey shows that economic and geopolitical developments are equally relevant. The countries of Africa and the Middle East are becoming increasingly important for the pharmaceutical industry and others. Although the political situation continues to cause uncertainties, the economic potential in African countries such as Tunisia, Egypt, Kenya and Ghana speaks in favour of these locations. The situation is a bit different in the Middle East given the regions plentiful energy resources which provides opportunities for industries that require an immense amount of energy for their production. This also includes the pharmaceutical industry which, according to the Industry Report<sup>2</sup>, is still one of the fastest growing sectors, despite crisis-related downturns. In 2018, for example, those responsible invested almost a third more in plants, buildings and machinery<sup>3</sup> than in the previous year. While debates about Brexit and negative forecasts<sup>4</sup> are fuelling discussions about the advisability of relocating production, at the same time it is also possible to observe trends in the opposite direction. Many companies are returning to Germany and investing in their production here, as one can read in the German Pharmacists' Journal<sup>5</sup> for example. ▲

# / Relocation must be profitable

**R**elocating production, regardless of motivation and direction, always brings with it a multitude of challenges. The change of location alone is cost-intensive in the first place, even if the operating costs on site are comparatively low. In addition, calculations must include an estimated 8–15% of the total plant price for recommissioning.

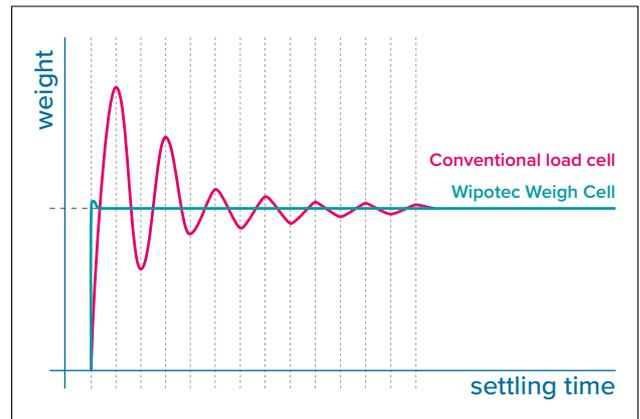
If, for whatever reason, commissioning gets out of control, additional costs are incurred due to production downtimes. In this case, expertise and good project management can help to speed up many things. Dismantling, packaging and transport must be followed seamlessly by re-assembly and commissioning. This covers the Design Qualification, which checks the machine concept, or an Installation Qualification for the machine equipment and installation, including documentation. The Operation Qualification (machine function with function test and simulation) and the Performance Qualification take up further time in order to demonstrate the technical performance. At the end of all these steps, simplified for our purposes here, the factory and site acceptance tests are signed and pharmaceutical production can begin. In the case of selected preparations<sup>6</sup>, if commissioning is delayed by even just a few hours, this can quickly cost pharmaceutical companies millions. ▲



# Speeding up commissioning and ensuring production quality

In the design stage what paths can machine and plant constructors, and manufacturing companies in all industries, take to avoid scenarios like these? How should components be designed, particularly those intended for sensitive areas such as weighing in quality control, to speed up commissioning and to make them virtually immune to errors arising due to relocation? Irrespective of whether they are in a hall, a plant or another country?

One possible answer is the proprietary Active Vibration Compensation (AVC) offered by manufacturer WIPOTEC. The company developed the sensor-based measurement technology to compensate all types of vibrations in production processes. AVC sensors are available individually but are also installed as standard components in Weigh Cells that are based on the principle of electro-magnetic force restoration (EMFR). A principle which is characteristic of the extremely short settling times and sampling rates of 1 millisecond. The Weigh Cell design is based on milled aluminium monoblocks in which AVC sensors are installed. As a result, Weigh Cells such as these deliver exact measured values, without any loss of time or quality, even when exposed to severe vibrations. ▲



Settling behaviour of a WIPOTEC Weigh Cell compared to a conventional load cell with strain gauge



# / Effectively filtering out vibrations

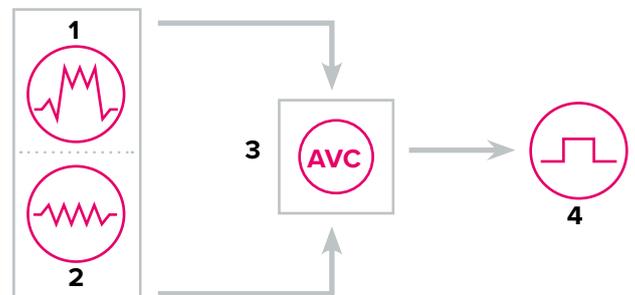
**A** look at the various causes of vibration that AVC can compensate for shows that using this weighing technology for quality assurance is not restricted to the production of pharmaceuticals. One-off impulse forces, such as those reached by the high accelerations in feed axes, can be filtered out just as well as disturbing forces which act on a production line via the foundation. The AVC sensors also filter out classic vibrations, such as those caused by drive units of machines or due to imbalance forces, making them potentially useful for all manufacturers.

Combining Weigh Cell technology with AVC sensors enables accurate product weight measurements. The patented AVC technology is, of course, a black box. The precise mechanical construction and the algorithms working in the background remain the manufacturer's secret.

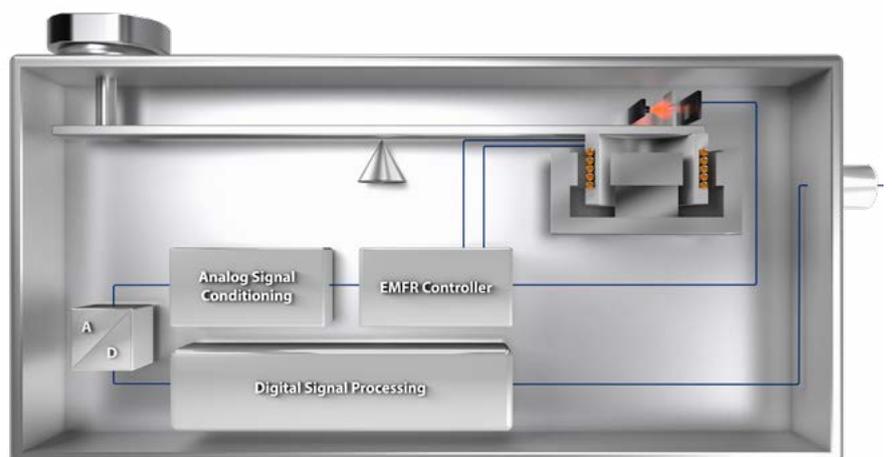
## Detecting three-dimensional vibration influences

A simplified diagram of the active principle illustrates the mode of operation: The sensors detect tilting to the left and right, backwards and forwards and all upward and downward movements. The fact that all three axes are covered by the sensor system also gave rise to the AVC's internal name of "3D sensor". Accordingly, companies can generally assume that regional

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- 1 Measuring signal with interference signal superimposition
- 2 Interference signal
- 3 Signal processing
- 4 Resulting useful signal without interference



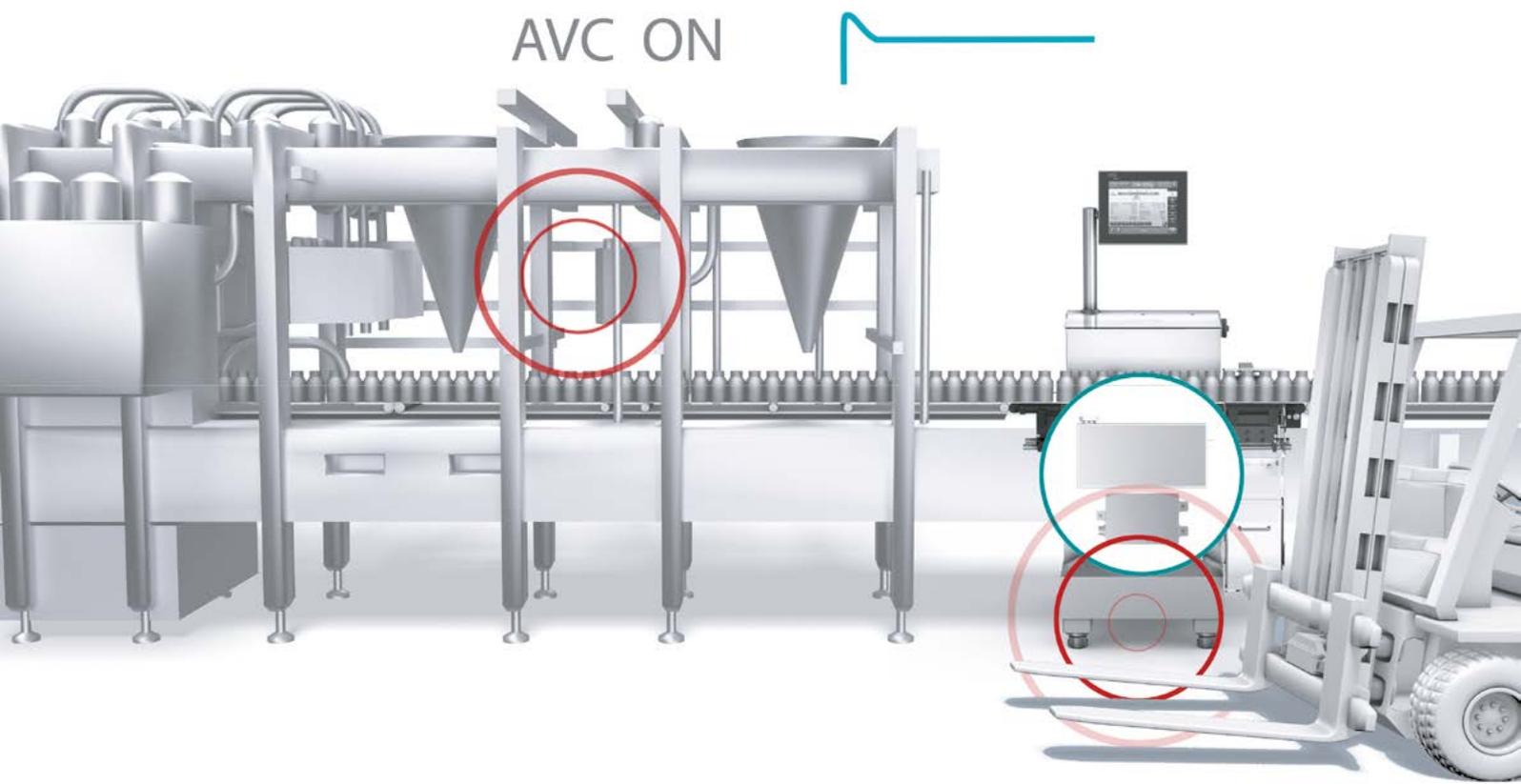
environmental parameters and geographic vibrations will be taken into account during all weighing processes, as well as the floor condition of a production hall, the physical structure of buildings or simply factors that cannot be planned for, such as a forklift passing a line. These sudden influences, which are often not reproducible and last only milliseconds, can have an adverse effect on the weighing result and therefore on quality control. AVC sensors detect all types of vibrations immediately and filter them out of the Weigh Cell. The weighing result transmitted contains the real production data, minus all interferences.

### Freedom of engineering design

This feature allows a constructive adaptation of the Weigh Cell to the machine chassis. There is no need for a separate frame for the Weigh Cell. AVC-assisted Weigh Cells will filter out the interferences at your installation site and always deliver valid data. Their ability to detect vibrations and respond immediately makes Weigh Cells with AVC sensors optimum components wherever exact weighing results are absolutely essential, such as in the production of pharmaceuticals or food. They are also ideal for systems whose target destination in the plant has not yet been

completely defined, or where it is already foreseeable during the building phase that a production relocation could be imminent.

Another application is machinery and systems as part of a study: If it is clear from the outset that a machine will be used alternately at different locations, there is a risk that the measured values will be incorrect, even though all the production parameters are exactly the same. To prevent this and remain flexible, even if room A has a different floor covering from room B, or there are machines running near room B whose vibrations have no noticeable effect on the test production, it is advisable to use Weigh Cells with AVC sensors. ▲



# / Conclusion

The fact that AVC Weigh Cells can generally filter out all the vibrations across all three axes illustrates the potential for quality control in processes which are running as well as for recommissioning in the case of planned plant downtimes or undesirable breakdowns. Once installed, Weigh Cells with AVC guarantee precise weighing results and accelerated validation and qualification during commissioning.

AVC-assisted Weigh Cells are components that make it easier to calculate the total cost of ownership. Parameters that were previously difficult to anticipate when calculating the total costs of a system become more predictable and transparent when using AVC-assisted Weigh Cells: from the acquisition and energy costs to repair costs and, last but not least, maintenance costs.

Put simply: In terms of quality assurance, anyone currently planning a machine or system, or who is having one designed and commissioned, need not fear a cost explosion due to complex qualification processes or even incorrect weighing results, either after a move within the company or a site relocation. This offers cross-sector security and the potential to reduce costs in times of an increasingly global location policy. ▲

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## SOURCES

- <sup>1</sup> "Auslandsinvestitionen steigen weiter – Inland profitiert", Report 2018 Deutscher Industrie und Handelskammertag [Association of German Chambers of Industry and Commerce]
- <sup>2</sup> Industry Report, 4th revised edition 2018, published by VfA & Institut der deutschen Wirtschaft, Forschungsstelle Pharmastandort Deutschland [German Economic Institute, Research Centre for Germany as a Pharmaceutical Location]
- <sup>3</sup> ibid.
- <sup>4</sup> <https://tageswoche.ch/gesellschaft/wie-lange-ueberlebt-die-pharma>
- <sup>5</sup> <https://www.deutsche-apotheker-zeitung.de/news/artikel/2017/04/28/rueckkehrer-aus-dem-ausland>
- <sup>6</sup> <https://www.wiwo.de/unternehmen/industrie/teure-medikamente-pillen-preise-an-der-schmerzgrenze-/11336558.html>