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# The World's most modern and extensive vibration system is put into operation.

## تشغيل منظومة الاهتزاز الأحدث والأوسع نطاقاً على مستوى العالم

In late 2006 the form manufacturer, Weckenmann, approached the vibration specialists at Brecon with a request for a joint venture in a project that, with 9 battery forms, was in every respect, extraordinary. As part of modernization measures at the DSK Blok concrete precast factory in St. Petersburg, Russia, the intention was to install battery forms for the vertical manufacture of wall elements, in addition to, a new pallet circulating plant for the horizontal production of slabs. A total of 9 battery forms, for vertical manufacturing of wall panels each with 2 sections containing 10 chambers each for wall panels were planned in two neighbouring bays. Besides the enormous dimensions of the steelwork, high demands with regard to vibration technology had to be discussed.

طلبت شركة تصنيع القوالب Weckenmann في أواخر العام ٢٠٠٦ من المتخصصين في تقنية الاهتزاز في بريكون إنشاء مشروع مشترك في مشروع يشتمل على ٩ بطاريات وهو مشروع غير عادي من كل الجوانب. وكجزء من تدابير التحديث بمصنع DSK Blok للخرسانة الجاهزة في سان بطرسبرج بروسيا، فقد كانت النية هي تركيب قوالب بطارية للتصنيع الرأسي لمكونات الجدران، بالإضافة إلى مفرش جديد يحيط بالمعمل للإنتاج الأفقي للألواح الخرسانية. وتم التخطيط لما مجموعه ٩ قوالب بطارية للتصنيع الرأسي للجدران ذات القطاعين والتي تحوي ١٠ غرف وذلك في منطقتين متجاورتين. وبخلاف الأبعاد الهائلة لأشغال الصلب فقد كان من اللازم التفكير في تلبية الطلب الكبير على تقنية الاهتزاز.

After several technical meetings with select experts from areas of concrete compaction, formwork technology, vibration technology, and system technology and visualization, a basic concept was corroborated within a few weeks for the best possible concrete compaction by means of vibration. Based on decades of experience, several variants were fundamentally available for the transmission of vibration into the intermediate form walls. Those variants that promised a

more intensive and even concrete compaction, whilst at the same time representing an optimisation for the complex formwork with respect to sealing and durability, were confirmed by means of FEM calculations.

The extraordinary dimensions of this project represented a corresponding risk with respect to the feasibility of putting this elaborate theory into practice in St. Petersburg. For this reason, the following require-

ments were considered during the entire process of development including, the possibility to check all vibration sequences, operating statuses, and the possibility to be able to adapt the system to changing conditions when required.

### Facts and figures from the DSK Blok project

- 748 Brecon vibration motors compact the concrete in 9 battery formworks, each with 20 compartments
- Two independent controllers with Siemens S7 PLC, touch panels and bus system
- 18 PLC large distributors supply the visualization with information
- 9 Siemens touch panels in redundant configuration
- 9 Brecon radio remote controllers in parallel to touch panel function
- Vibration is applied to 180 concrete walls
- Integrated system with multifunctional operation and visual checking of all vibration motors and vibration processes.

Since the vast majority of the 748 vibration motors would not be visible and are only accessible with some effort, it was made clear very quickly that visualization of the vibrators and vibrator groups was essential. Without visualization it would be very difficult for the operators to determine whether the correct vibrators have actually been selected and are ready to function, or whether the vibration is being transmitted from another area of the form.



Fig. 1: The control equipment for the vibration of five battery formworks with almost 500 vibrators is installed on a railing at a height of 4 metres. All five control units can mutually replace each other without switching over (redundancy).



Fig. 2: A second row of four battery formworks runs parallel to the first row. The control equipment for the vibration is installed 'back to back' and has identical functions. The radio remote controllers are isolated from each other, however.

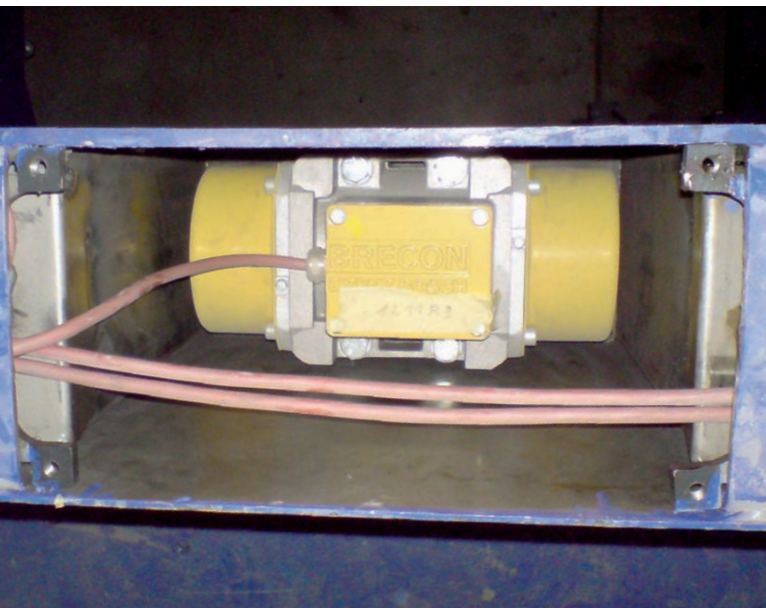


Fig. 3: Brecon special vibrator in the partition wall

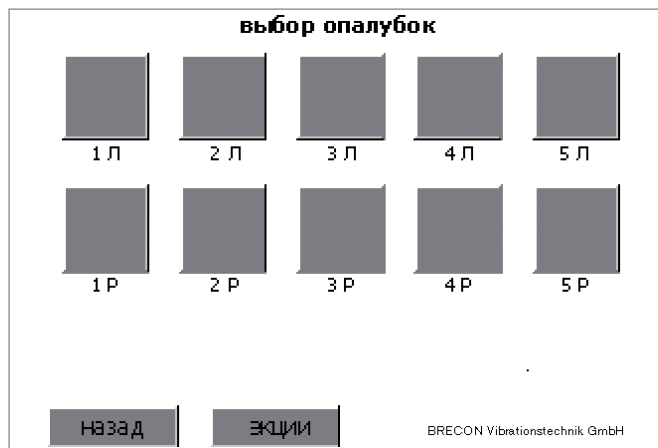


Fig. 4: Touch panel: selection of the battery formwork to be poured

To further complicate the matter, vibration can be applied at two levels depending on the fill level, so the choice of the correct compartment alone would not suffice. Because the concrete quality depends on superior and accurate vibration, it was absolutely critical that the vibration times of the lower and upper levels are matched to the filling process so that the vibration frequency can be adjusted as the filling height increases. Therefore, it was found to be crucial for the operator to visualize the exact positioning of vibrators needed. In order to meet the requirements of these optimized battery forms, it was necessary to develop a new vibration motor with the following characteristics:

- Harmonic concrete compaction by means of synchronous vibration induction
- Noise reduction due to synchronous equipment (100 Hz, 380 V)
- Special slimline housing for confined installation space
- Temperature tolerances up to 200 °C due to oil heating in the partition walls
- Special seals for hot/cold operation
- Vibration-compatible hot bearing lubricant

### Operation sequence for the concreting process

First of all, the operator selects the battery form that is to be filled and he then decides whether the ten compartments on the right-hand side or the ten on the left-hand side should be filled first (fig. 4). The first compartment to be filled is then selected (fig. 5). From then on the plant is ready to operate and the further steps depend on the concrete delivery. The operator can select the check function for the vibrators during both the idling and pouring process (fig.6). Depending on the concrete consistency and the steel reinforcement, the worker can now decide whether to begin with the vibration in the lower part of the concrete compartment only or whether to vibrate the entire compartment immediately at a low to medium frequency in order to accelerate the filling procedure (fig. 7).

As the concrete level increases, the frequency and hence the vibration force is raised. At any point, the frequency at each interval can be seen on the touch panel. The choice of the vibration levels can also be changed at any time. After sufficient compaction, the next compartment can be selected by a single push of a button on the radio remote controller or on the touch panel. The operator's understanding of the compaction process is significantly increased by the detailed visualization of the position and operating status of each

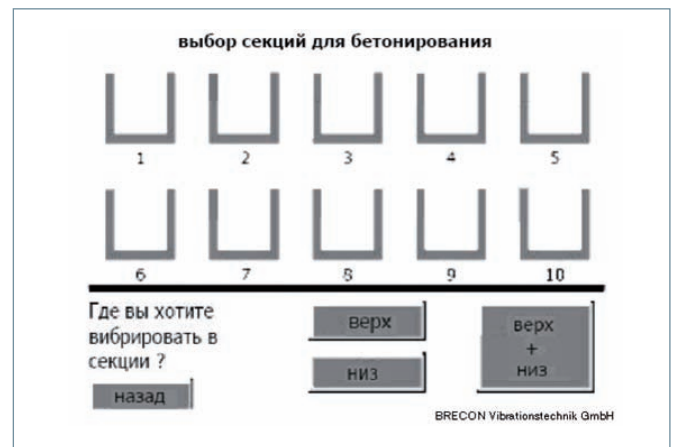


Fig. 5: Touch panel: Selection of the wall compartment and selection of the vibration zone in the compartment

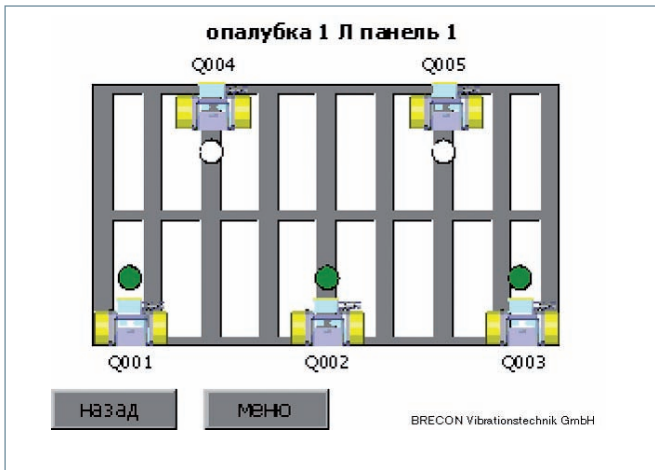


Fig. 6: Touch panel: All 748 vibrators are visualised; the operating status can be checked



Fig. 7: Touch panel: The displayed vibration frequency can be adjusted at any time on the touch panel or via the radio transmitter. Adjacent to that, information on the form selection and vibrator verification.



Fig. 8: Project manager Alexander D. Jaroshenko (DSK Blok) operates the vibration compaction via one of the new Brecon touch panels.



Fig. 9: Synchronous vibrator in the vibration station



Fig. 10: The project manager Alexander D. Jaroshenko from DSK Blok is pleased with the clean, tidy installation

individual vibrator on the inside of the form (fig. 8). Maximum reproduction of the compaction process is made possible in conjunction with the permanent display of the vibration frequency.

The controller further assists the user by making the full operation and check function of the neighbouring battery forms available at all times to all four (or all five) touch panels so that it is not even necessary to switch over to corresponding touch panels. The vibration process can be controlled at all times either by radio, the touch panel directly on the forms, or manually on the central control cabinet. Due to the very close cooperation between the vibration experts from Brecon and the formwork professionals from Weckenmann, even as early as at the design stage, excellent concrete compaction quality and functionality of the pouring process was achieved. In this project the steelwork and the plant conception were specially tailored to concrete compaction by means of vibration.

The circulation plant (fig. 9), which was installed in parallel with the battery formworks, was also equipped with synchronous Brecon external vibrators in order to minimize noise emission and achieve homogeneous concrete compaction. In this case, however, it was possible to select the standard synchronous vibrator for normal environments.

The result of this close cooperation between the companies involved also convinced the project manager from DSK Blok, Mr Alexander D. Jaroshenko who stated: "We only got to know the specialist company Brecon Vibrationstechnik during the course of the assembly of the battery forms. We are very pleased that our contractor Vollert | Weckenmann chose the quality and

experience of Brecon. The specialists from Brecon convinced us with their reliability and expert knowledge. This type of partnership is absolutely necessary in order to be able to operate such a complex plant without problems."

#### FURTHER INFORMATION

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