WIRTGEN GROUP

Wirtgen

Job Report Cold Milling

Perfect surface evenness: W 2200 with 3D control

Wirtgen cold milling:

Perfect surface evenness for automotive engineering: Two W 2200s mill off 500,000 m² using 3D control

Elk tests, brake testing, extreme driving situations – car manufacturers test all that and more on large "dynamics areas". Such areas need to have a defined cross-section in order to enable the correct evaluation of test results.

German car manufacturer VW owns a 250,000 m² large testing ground in the vicinity of Wolfsburg, the surface course of which no longer met the high demands placed on it. Rehabilitation involved the use of two W 2200 high-performance milling machines from Wirtgen fitted with 3D control system, which removed the surface and binder courses in two machine passes. In the process, they created a surface having a new, defined horizontal position, and thus ideal conditions for the subsequent paving of a new asphalt course.

Remodel terrain using 3D control

The milling job was a typical application of the 3D control system as the existing surface deviated from the specified plane in all three directions. Rehabilitation using a 3D control system was the only method that would allow reshaping of the surface at the same time.

It works independently of references on the ground, using a digital terrain model instead as specified default value for the milling depth. In that way, areas can be re-defined and re-created independent of their existing horizontal position and slope. Wirtgen milling machines fitted with 3D control produce the desired accuracy in the millimetre range. Requirements on the testing ground near Wolfsburg were extremely high: the horizontal position of the milled surface was allowed to deviate from the specified level by a maximum of ± 2 mm.

SAT Straßensanierung GmbH was awarded the contract for carrying out this highly demanding job. "For the job in Wolfsburg, two of our W 2200 cold milling machines, which usually work with wire-rope or ultrasonic sensors, were converted to the 3D control system," says site manageress Aleksandra Rompa, explaining the setup of the machines. This can be done because the hardware and software of the Wirtgen levelling systems include a standard pre-installation for the 3D systems of common manufacturers.

At the client's request, the 250,000 m² large area was milled off in two separate layers. For this operation, SAT used standard milling drums from Wirtgen with a tool spacing of 15 mm. After 7 weeks altogether, the two large milling machines from Wirtgen had given the surface an entirely new cross-section. ▼

Success factor W 2200

Despite the fairly low milling depth, several reasons were speaking in favour of using the W 2200 in this large project. From a technical viewpoint, the machine impresses with its high weight, which ensures an exceptionally smooth operation and minimizes vibrations at the prism. This is important when working with the 3D control system because the position of the prism is vital for correct measurement and high-quality work results.

The W 2200 was the prime choice also, however, for reasons of economic efficiency. In this project, the milling width of 2.20 m was a particularly valuable asset: it minimizes the time needed for reversing the machine and helps

◀ SAT site manageress Rompa is in radio contact with a surveyor at the tachymeter during surveying of the control points.

The tachymeter is aligned with the prism once. Everything else is controlled by the system automatically.

One reason for SAT deciding to use a W 2200 from Wirtgen for restoring the evenness on the VW testing ground was that the machine's large milling width of 2.20 m and high engine performance permit the fast completion of any project. In addition, these high-performance machines are particularly economical especially in large construction projects.

to speed up completion of the project. Yet another mark in favour is the machine's milling speed combined with the quality achieved. The high-performance milling machine removed the pavement at a speed of approx. 7 m/min, working at milling depths of 5 cm and 7 cm respectively.

Needless to say – a W 2200 is capable of milling much faster at such low working depths. The chosen advance speed was ideal, however, to ensure continuous milling while achieving an exceptionally high degree of precision at the same time. Considering the high quality requirements, the overall project was completed within a short period of time.

The right cutting technology on board

For their operation on the VW site, the two W 2200 machines were fitted with standard milling drums of 15 mm tool spacing, HT11 quick-change toolholders and cutting tools type W8 EHR. The HT11 quick-change toolholder system ensures optimum tool rotation, as well as low and even cutting tool wear and tear. In addition, the numerous advantages offered by the overall design of the Wirtgen milling drums, combined with the HT 11 system, produce a consistently good milling pattern even after countless operating hours.

The cutting tools type W8 EHR used in this project stand out in particular through their high-quality, low-wear materials and further enhanced shape design which minimizes wear and tear, thus scoring top marks in terms of economic efficiency. The new, special coating of the clamping sleeve additionally permits extremely simple insertion and extraction of the tools, ensuring short downtimes during tool replacement and thus increasing productivity.

500,000 m² in just seven weeks

At the client's request, the asphalt pavement on the 250,000 m² large area was removed in two separate layers. In effect, the two high-performance milling machines therefore needed to mill off a total area of 500,000 m². The aim was to make sure that a perfectly even surface would be created in the first milling pass, which then needed to be milled off by a fixed amount only in the second pass. It goes without saying that both steps of the operation were carried out using the 3D levelling system.

The two high-performance milling machines needed 7 weeks altogether to complete this job. Holger Oldach, manager of the milling division at SAT in Hamburg, is highly satisfied with both the progress and the outcome of the project: "The two W 2200s did an excellent job, and with the 3D control system produced a new cross-section that adheres to the default values specified by the digital terrain model. On the whole, this technology isn't any more complicated than other levelling methods. Know-how and experience in surveying are important, however, in order to solve demanding tasks like this one."

The new milled surface precisely adheres to the position in space specified by the client. In addition, the excellent evenness enabled the asphalt to be paved in uniform layer thickness, thus offering great potential for material savings.

The operating principle of 3D control

Components of the system
The Wirtgen 3D control system comprises four main components:
– a prism on the cold milling machine,
– a total station which tracks the prism automatically,
– a radio connection between the total station and the cold milling machine, and
– a system computer on the machine.

This process is particularly suitable for milling large areas which are to be given a new cross-section, for example, on airports or special areas as described on the previous pages. The technology can also be used, however, for the highly precise modelling of complicated cross-sections on other traffic areas.

Fast and easy setup
To get the cold milling machine ready for operation, a prism is mounted at a mast on the machine. In addition, the system computer of the 3D control system including control panel is plugged into the Wirtgen automatic levelling system and connected to a radio transmitter. The modules are connected quickly and easily via plugs. The specified cross-section of the completed area needs to be defined prior to commencement of the milling operation. Planners or surveyors establish these parameters and install them on the system computer of the 3D control system.

Precision milling with automatic target recognition
During the milling operation, the prism is tracked by a total station with automatic target recognition, a so-called tachymeter. The level of the prism serves as a reference for the specified level of the milled surface. When the milling machine changes its position, the total station keeps tracking the prism automatically, continuously locating its position in space. This information is transmitted by radio from the tachymeter to the system computer on the machine. In case the measured level deviates from the specified level, the system computer forwards the information to the machine control system. The cold milling machine responds immediately by correcting the milling depth. The continuous measuring and transmission of data by wire ensures response times in the millisecond range.

◀ **The mast with prism is installed right above the lowest point of the milling drum. The two radio transmitters, connected to the system computer, are attached at the canopy roof above the operator's platform.**

Economical in every aspect

The 3D process is convincing also in terms of costs. The parameters established by the surveyor once can be used again in the next step to place the new pavement by means of wireless control. In addition, the preliminary work is much more cost-efficient than the installation of stringlines.

Quality control – both internally and vis-à-vis the client – reveals further advantages because the project parameters are stored in the system computer and can be used as a log of the entire operation.

◀ **The system computer on the operator's platform of the machine indicates both the specified and the actual values. The system makes work easier for the milling machine operator who does not have to pay attention to the milling depth.**

Successful quality control: measurements carried out with an additional total station and prism referencing on the milled surface behind the machine show that the system performs at the required accuracy. Check measurements carried out by the client verified the correct horizontal position of the milled surface within the specified tolerance range.

Wirtgen GmbH
Reinhard-Wirtgen-Str. 2 · 53578 Windhagen · Germany
Phone: +49 (0) 26 45 / 131-0 · Fax: +49 (0) 26 45 / 131-242
Internet: www.wirtgen.com · E-Mail: info@wirtgen.com