At the end of June 2006, Putzmeister AG said goodbye to its longstanding board member Dr. Hartmut Benckert. Whoever knows HB – as is his internal abbreviation – will know that retirement is a long way off yet. Instead, he is going to remain “unretired” and active.

A multitude of Putzmeister innovations and major technical breakthroughs over the last 25 years can be attributed to ideas and proposals of the engineer who was born in Husum, northern Germany, in 1946 and grew up in Bremen. These include the forward-looking Free-Flow Hydraulics FFH (1982), the computer-controlled highly flexible handling system HFH (1986) and the computer-aided and sensor-monitored mobile SKYWASH robots. The know-how behind these highly complex systems would years later form the basis for the joystick-controlled EBC Electronic Boom Control and for the conception of other ERGONIC modules.

With the establishment of the US PM subsidiary in the 80s and 90s, Dr. Benckert faced an altogether different challenge. The list of outstanding technical achievements would soon include the development of high-performance concrete pumps, to which Putzmeister owes much of its world records in high-rise concrete pumping (most recently 532 m in 1994), and the series manufacture of the largest PM track-mounted concrete pump with a vertical reach of up to 63 m (2005).

Following his studies (mechanical engineering, aerospace engineering) and completion of his dissertation at TU Stuttgart, Dr. Benckert spent the next six years working in turbine and power plant engineering. In April 1981, he moved to Putzmeister taking the role of assistant to the Managing Director and PM founder, Karl Schlecht. Some time later he became test manager and, in 1988, was appointed general manager of the Engineering division. Since then, he has been responsible for Engineering, Production, Quality Assurance and Technical Services.

During the conversion in 1996 of the former Putzmeister GmbH into the legal form of public limited company, or Aktiengesellschaft (AG), Dr. Hartmut Benckert was offered an appointment to member of the board. As part of the establishment of the AG, it was also a condition that the contracts of all PM board members would expire in their 60th year. For HB, this time has now come.

His colleagues have come to know him as a meticulous and single-minded worker. A large number of concrete pump operators at home and abroad, who have for years maintained close, personal contact with him, hold in high regard his readiness to think laterally and to resolutely implement even unconventional solutions. “Hurricane Harry” – as is his nickname in the USA – took on technical challenges with relish and in ambitious developments he would often identify a benefit where others would only see the risks. Many of his ideas are now patent-protected.

What did he enjoy most in all his years with Putzmeister? The answer came swiftly: “The freedom of expression that I had here!” In his opinion, one of the greatest challenges facing the company in the future is the development of mechatronics, i.e. the meshing, or symbiosis, of mechanics, hydraulics and electronics with the aim of being able to offer “intelligent” construction machinery. What pleases him – and this is also something in which he has personally played a not insignificant part – is the healthy growth of the company throughout the years and the expansion of sites.

With his great commitment to PM AG, his participation in a variety of associations (more notably in several committees of the German Engineering Federation VDMA and as President of the Committee for European Construction Equipment) and voluntary activities in regional politics, the private interests in HB’s life had been forced to take somewhat of a back seat. This has changed since July, with Dr. Hartmut Benckert finding more time for his hobbies of cycling, riding and mountain climbing. And he is looking to take on new responsibilities in this new chapter in his life, albeit in a different area to before: “I’d like to try lending my experience to economic policy!”

As a source of valuable experience, PM AG also wants him to remain available as a consultant.

He wishes his successor, Dr. Mehmet Varlik, the best of luck and the courage to meet the new challenges in a rapidly changing environment head on, even if the solutions happen to be unconventional.
By the end of 2005, Putzmeister AG had announced the development of an extremely compact truck-mounted concrete pump with a 20-metre “four-arm” boom. Even in the project stage, the combination of minimal support width, lower unfolding height, short arm segments, flexible boom kinematics and a robust pump assembly promised a fascinating working machine.

The technology and air-conditioning system of the building is located in a separate room on the flat roof and is being completely renovated along with the load-bearing subsystem by Bauwerk-Sanierung Rhein-Neckar GmbH (BWS).

Since the ceilings could only be subjected to low load for static reasons, it was only possible to use lightweight concrete with a specific weight of no more than 1,900 kg/m³ for the foundation of the new technology room. The BWS foreman said, “This means we have 500 kg less ceiling load per cubic metre concrete!” To deliver the lightweight concrete (grain size 0/8 mm, strength class LC 25/28) approximately 15 m high and up to 30 m wide, BWS ordered a truck-mounted concrete pump from Betonpumpendienst Rhein-Main (BRM, Lorsch). The precondition was that the machine would not only have to be suitable for pumping lightweight concrete but also be able to manage with the restricted space on the Institute grounds.

BRM dispatcher, Walter Stinner, decided that the new M 20-4 should take on the task. With a maximum support width of 3.4 m forward and 2.5 m aft (i.e. inside chassis width), there was still sufficient space around the construction site for the delivery hoses and tubes carried in magazines. The delivery of the first machines began after the presentation at the trade fair INTERMAT in Paris in April 2006. With the following examples of application, Putzmeister would like to take this opportunity to present the new M 20-4 ZR in typical construction site situations.

Restoration with lightweight concrete

In Heidelberg, buildings of up to 50 years old at the Max Planck Institute for nuclear physics are presently undergoing modernisation. Also benefiting from the restoration project is the adjoining Gentner laboratory. The BWS foreman said, “This means we have 500 kg less ceiling load per cubic metre concrete!” To deliver the lightweight concrete (grain size 0/8 mm, strength class LC 25/28) approximately 15 m high and up to 30 m wide, BWS ordered a truck-mounted concrete pump from Betonpumpendienst Rhein-Main (BRM, Lorsch). The precondition was that the machine would not only have to be suitable for pumping lightweight concrete but also be able to manage with the restricted space on the Institute grounds.

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The EPS module (Ergonomic Pump System) is standard equipment on the M 20-4 and, unlike conventional hydraulic control systems, regulates the functions of the concrete pumps electronically. This makes it possible to optimise the pumping process in line with the prevailing conditions. The EPS system supports adjustment of the maximum delivery hydraulic pressure and thus the concrete pressure too.

Caution: lightweight concrete!

The pumping of lightweight concrete demands the utmost attention of the machine operator. This is because most lightweight aggregates (swelling clay granulate) are porous and absorb water and concrete fines under pressure. As this causes discontinuity in the lubricating film on the inner wall of the tube or hose, the properties of segregation and therefore blockages are programmed. An increase in the conveying pressure would result in the blockage being further compressed and it would remain blocked. The following tips should help to avoid problems in the pumping of lightweight concrete:

- Check whether the aggregates have been prewetted in the concrete factory.
- Increase the mixing time. The duration depends on the type of admixture. It is two minutes for the addition of poly-carboxylic ether (PCE), for example.
- Start pumping with considerably more than with standard concrete. There must be sufficient lubrication over the entire length of the line.
- Only pump at low output.
- Specify the lowest possible maximum pressure using the EPS system.

Particularly favoured is, incidentally, the use of the rotor pump system for delivery of lightweight concrete that Putzmeister offers not only for PUMP® truck-mixer concrete pumps but also for truck-mounted concrete pumps with booms with a vertical reach of 28 m. The reason for this is the system’s inherently low conveying pressure (max. 25 bar) and the highly uniform delivery of the rotor with only low pressure peaks.

The advantage of lightweight concrete – in addition to its low deadweight – is also its low thermal conductivity. A disadvantage of this material is the elasticity module that decreases disproportionately with bulk density. Lightweight concretes with bulk densities of between 800 and 2,000 kg/m³ are the norm today. However, the bulk density of unhardened, pumpable lightweight concrete should not be below 1,800 kg/m³ (corresponds to bulk density class 1-6). The fine fraction of natural sand is also important to the pumpability of the concrete. The technically possible, lower weight threshold for lightweight concrete is currently around 350 kg/m³.
Boom as pipe bridge

In Zürich-Müllingen, the Swiss Post is having its distribution centre, built in 1985, converted in wide sections for around CHF 110 million (approximately 70 million euros). Concrete was delivered into the lightweight false ceilings by a flexible M 20-4, firstly through the boom pipework and then a 130 m long hose line.

To increase the effective area, the extensive construction measures also include putting in large false ceilings in the high rooms. These photos were taken as one of the ceiling formworks measuring 1,600 m$^2$ was being filled with 250 m$^3$ of concrete, strength class C35/45. A highly modern letter distribution centre will be commissioned here on completion of the work.

The new M 20-4 of a Betonpumpen AG (Affoltern) was deployed for this application for various reasons: on the one hand, the space available was perfectly adequate for setting up the machine; on the other hand, the “four-arm” boom could be fed through any of the desired window openings. Furthermore, the machine operator had a sufficient number of hoses on board to still be able to fill the ceiling formwork deep within the room. The total extension was eventually 130 m.

Narrow roadway, plenty of support

On the outskirts of Munich, the municipality of Ottobrunn is having a new communal services industrial park, including extensive commercial premises, built on the grounds of a former airport for 2.7 million euros. In addition to the buildings, warehousing structures and workshops, the construction project also includes permanent spaces for the comprehensive fleet of vehicles. Due to the relatively high surface load – this area is used for the parking of HGVs, road sweepers, snow ploughs, etc. – a concrete of somewhat higher strength (C30/37) is required. The narrow yet long sections measuring 50 to 100 m$^2$ are being concreted by the new M 20-4 of BFM (Betonförderdienst München GmbH Co.KG). Since roadways with a width of more than just 3.5 m for supporting the truck-mounted concrete pump are few and far between, the M 20-4 was a natural first choice.

Space enough for oncoming traffic

Even weeks after the event, machine operator Bernd Blöhe remembers well one of the first times his new M 20-4 was put to use. “Man, that time in Feldmoching was a close call…” says the Berlin-born, Betonförderdienst München (BFM) machine operator who has lived in Bavaria for over 15 years.

The reason for this “lasting memory” was the search for a suitable set-up area for the BSF 20.09 H that was employed first a few days before. Now, this machine does not, in fact, require very much space at all, but even its minimum (support width front 3.4 m, rear only 2.5 m within the vehicle’s surface area) did not appear to be available.

Before we go into more detail here, we should first get a general idea of the construction site conditions. The order of the Deutsche Bahn AG commissioned the restoration of an extremely busy railway bridge for regional and cross country traffic, including the two side wing caps. The bridge spans a similarly hectic through road, which has been closed off on one side for the duration of the construction work. Traffic lights control the traffic, which is only able to move along the single free lane. The other lane – the width of which is not even 2.8 m – is required for the erection of the construction site. At the same time, this happens to be the only set-up site for a truck-mounted concrete pump in the entire surrounding area.

Machine operator, Blöhe, parks the 2-axle vehicle in the closed lane in such a way that the foot of the right-hand forward support leg, with a support plate for an underlay, is positioned precisely on the white centre line marking, which is approximately 10 cm wide. This may sound unbelievable, but every centimetre counts in these conditions. On the left-hand side of the truck, things get trickier because the tyres of the machine are already in contact with the kerb, the support foot must find space to rest half on the narrow verge, half on the embankment. In addition to the support plate, adequately dimensioned timber blocks ensured the safe set-up of the machine. Bernd Blöhe: “Well, then I raised the arm assembly, unfolded the four-arm boom and it was then the mixers’ turn!”
M 20-4 as rotor pump

On this construction site, too, it was only possible to work with truck-mounted concrete pumps that could find a support area between palettes, cranes, construction materials, skips, a pit across the way and craftsmen parking their vehicles. This is because the actual construction site road has to remain clear for construction vehicles and delivery traffic.

The company responsible for the building carcass had ordered the BSF 20.09 H as a pure rotor pump to deliver two or three mixer loads of fine concrete for the floor into the basement of one of the new builds.

To be able to reach all basement rooms of the house, the machine operator requires a hose line of 80 m (ND 65) in total as an extension up to the placement site. To create the transition from the hopper outlet to the hose line, the M 20-4 carries three reducers on-board: a relatively short adapter for the transition from the hinged/pivoting elbow to the standard delivery line cross section ($D 150/125 \text{ mm}$); another for adapting to the smaller diameter of the 3-metre extension tubes ($D 125/100 \text{ mm}$) carted on-board; and a relatively long reducer for the transition to the ND 65 hoses.

Fitting the reducers only takes a matter of minutes. In the meantime, the co-workers on the construction site brought some of the 16 hoses into the basement and connected them together using quick-release couplers. The other delivery hoses ran overground; these, too, are joined together with a small number of handles and connected to the final reducer. Then it's all hands to the pump!

Concrete placement in the 2nd row

In the Munich district of Laim, the new M 20-4 of JUMBO pumping services is pumping concrete not only through the boom pipework, but also through an extension line connected to it. Around 200 m$^3$ is to be placed from 10.30 am onwards. The construction site is situated more or less in the 2nd row: an unfavourable location set behind the actual road-side buildings that “normal” truck-mounted concrete pumps with placing boom would find difficult to reach.

The grounds are home to the development of 46 private apartments, a retail outlet and underground parking levels. Being concreted today is the 40 cm-thick basement garage. Site manager: “We can't set up conventional boom pumps here without blocking the road or the pavement. And because our site is on Fürstenrieder Straße, a road with six lanes, we can't just move the pavement onto the other side of the road like that either!” Yet the M 20 four-arm does manage to find space for a set-up area measuring – with maximum support – just 3.4 m by 8.8 m between the extremely busy road and the walkway. The support legs are lowered and the boom stretched out to the side in no time. The nine, 3-metre, ND 100 pipe sections and the three extension hoses (5 m) are routed and connected to the boom tip with the help of the site personnel within minutes. The machine operator exchanged the end hose for a normal 3-m delivery hose with spout beforehand. The machine operator fits a suitable reducer between this delivery hose ($D 125 \text{ mm}$) and the first pipe section ($D 100 \text{ mm}$); and between the delivery pipe ($D 100 \text{ mm}$) and the hose line ($D 65 \text{ mm}$). In this way, the compact M 20 is able to achieve the horizontal working range of a long-reach boom pump in the 60-metre class. As the truck mixers arrive through the traffic without delay, concreting of the ceiling formwork is already complete by the early afternoon.
Side anchoring with compact spray concrete pump

Small-scale construction machinery has authorised access even on the largest of construction sites. For even where ground conditions are difficult, they are mobile, easily repositioned and up and running in a short space of time. This is demonstrated by this application report from south east Asia on a Putzmeister spray concrete pump.

In Laos, one of the poorest countries in the region, the harnessing of water power to generate electricity is playing an increasingly important role. The country needs the electricity not only to supply its own population and domestic industry on the one hand, but to export it for currency earnings on the other. The income earned will mainly be used to fund the expansion of the Laosian infrastructure. The main consumer of the power supply is neighbouring Thailand, which has been supplied with electricity from the Nam Ngum 1 water power station since as early as 1971.

More hydroelectric power stations have been built in the country in the meantime and work on the current major construction site of Nam Ngum 2 – also in the catchment basin of the Nam Ngum River – is making progress. The reservoir dam project essentially comprises a 169 m high arch, a hydroelectric power station with an output of 615 MW and two 1 km long head race tunnels each measuring 12 m in diameter. Nam Ngum 2 is being built under a contract awarded to Thai construction firm, Ch. Karnchang, as the principle contractor. The costs of the project run to around US $ 830 million (approximately 654 million euros) and completion is scheduled for 2011.

Before the valley is flooded, the loose rocks on the relatively steep mountain sides must be prevented from causing a possible landslide. These areas are anchored using spray concrete. For this purpose, Ch. Karnchang employs two small, hydraulically-controlled Putzmeister P 715 TD piston pumps, which regulate the synchronised addition of the hardening accelerator by means of separate metering devices. The P 715 TD model is essentially equivalent to the earlier BSA 702 D PM fine concrete pumps and achieves a pump output of up to 18 m³/h.

The P 715 TD concrete pumps have a piston stroke of over 700 mm, a delivery cylinder diameter of 100 mm and are driven by a 30 kW diesel engine (electric motor as an option). Of course, they can be used not only for concrete spraying but also for the delivery of concrete through piping and hoses. The maximum grain size in the concrete should not exceed 16 mm with this application. The solution for cleaning the actual core pump and hopper is exemplary: through the side-mounted flaps on the upper section of the hopper, there is access to all areas that have come into contact with concrete by the time pumping is over.

Between Madrid and Valencia – the M 42-5 has a full schedule

Even the Spanish pumping services – who in recent years have been known mainly as users of long-reach-boom concrete pumps in the 50 and 60-metre class – are showing an increasing interest in the new M 42 “five-arm”.

The first machine of this model for Spain was delivered in May to Emipesa S.A., a company that, in addition to truck-mounted concrete pumps, also operates concrete, mortar and stone breaking works and a gravel pit. Emipesa’s site is located in the Province of Teruel between Madrid and Valencia.

After the machine operators had been given introductory instructions by engineers from the PM subsidiary, Putzmeister Iberica, two of the “right kind” of construction sites eagerly awaited the new M 42-5. One of these construction projects was an apartment block for 57 homes in Teruel (requiring around 1,800 m³ of pumped concrete), the other a smaller, three-floor hotel in Mas de Andrés, not far from the Emipesa headquarters. In this case, the top floor had yet to be concreted. Even for weeks ahead, the dispatch office in Teruel had been inundated with orders for the new M 42-5.

Machine operator, Raúl Jarque, appeared extremely satisfied with his new “five-arm” at the end of day one. It was the flexibility of the boom and the ease of use that appealed most.
Since mid-2004, the Hungarian government has made the expansion of infrastructure its top priority. By the end of 2006, the country’s motorway network will have almost doubled in length from 700 km to around 1,200 km. The projects of prime importance include the completion of the M7 motorway from Budapest to the Croatian border. Four stationary Putzmeister placing booms and two PM concrete pumps are also there to help with a demanding bridge construction en route.

On the southern shore of Lake Balaton, construction of the spectacular Köröshegy bridge project along a section of the M7 is underway. On completion, this valley crossing will be the longest land bridge in Central Europe. The main contractor for the project is the Hungarian construction firm, Hidepito RT (Budapest).

The new motorway viaduct is supported on 16 conically tapered pillars reaching heights of up to 80 m. Wall thicknesses therefore decrease with increasing progress in the construction. Each of the pillars are topped with 6 m long, 23 m wide, 7 m high hammer heads that have been concreted in three sections. Several PM track-mounted concrete pumps with vertical reaches of up to 36 m were present for months to participate in the concreting of the pillars, including foundations and heads. The machines were connected to risers for the maximum heights of delivery.

The bridge superstructure is created in 11 m long sections using launching gantries. The bridge builders concrete the segments of the superstructure in two steps: first the floor slab and footbridges are cast, then the viaduct floor slab and cut-outs are created. Around ten to twelve days are required to manufacture a segment.

The valley crossing at Köröshegy is part of a 15 km long motorway section that includes three bridges, the construction costs of which are reported to be 258 million euros. The foundation work began in September 2004; completion is estimated for mid-2007.
Car tyres and delivery hoses share common ground: both have a carcass (usually made of steel mesh) and a wear layer made of abrasionproof rubber. While the structure of the carcass is critical to driving characteristics (tyres) or pressure resistance (delivery hose), the thickness of the rubber layer, among other factors, is decisive to the service life of the tyre or concrete delivery hose. With car tyres, it is radial tyres (steel breaker tyres) that have long since found general acceptance due to the improvement in driving characteristics that they offer by comparison with diagonal tyres. With concrete delivery hoses, the more practical of operators will similarly opt for the high-quality design with braided steel wire reinforcement. What with the expensive costs of manufacture, these hoses naturally have their price.

Supposed bargains are regularly turning up on the market. As part of its product planning, therefore, the Putzmeister Parts Service arranged for Contitec to carry out a monitoring, therefore, the Putzmeister Parts Service arranged for Contitec to carry out a closer examination of the concrete delivery hoses from what at first glance appeared to be a value-for-money manufacturer. As early as the pressure test, the naked eye could see that the third-party product deformed noticeably even before the manufacturer’s specified concrete pressure had been reached. The material inspection then confirmed the first impression. We have listed the result of the material inspection in the table above. The inspected hoses were SK65, 5-metre hoses.

The production of Putzmeister delivery hoses is highly complex and the fruit of long experience. While the hoseslines consist entirely of rubber and the bushes on the outside, the internal structure is substantially more involved: with the PM hoses, a network of steel wire is braided around the inner hose, which is made of 6 – 7 mm thick rubber material. The inspected hose of the competitor, on the other hand, had only a lapped steel reinforcement. Hoses of this construction are indeed more cost-effective to manufacture, but a lapped steel reinforcement needs considerably more space than a braided one. This is compensated for by a thinner rubber layer, which reduces the service life of the hose.

The outer layer of a Putzmeister hose is usually a 2.5 mm thick sprayed-on jacket that protects the hose from external damage. There then follows the banding of the basic hoses and their vulcanisation. To prevent the formation of uneven areas when joining the galvanised and tempered bushes to the inner wall of the hose, the PM hoses are stripped of their casing in these areas as this serves to drastically reduce the risk of blockages. As a consequence of the thinner inner and outer layer alone, the alternative hose would have to be approximately 30 % cheaper, which was not the case.

The theft was noticed the next morning when driver, Falk Berger, wanted to drive his truck to the first pumping operation of the day. The police were called, the theft reported and a search carried out for the missing M 24. Meanwhile, the Tagerwerben concrete pumps informed the dispatch office of TBG Betonpumpendienst Berlin of the theft of the concrete pump stationed with them. From central dispatch in Berlin-Hoppegarten, all TBG concrete pumps in Brandenburg, Mecklenburg-Western Pomerania, Berlin, Saxony, Saxony-Anhalt and Thuringia received their orders. Back-up also came in the form of the PM DAISY® XP fleet management system.

The data and information system (DAISY®) was developed by Putzmeister back in the nineties for the management accounting of concrete pumps. It networks important information and operational data between the dispatch office, the truck-mounted concrete pumps and their operators. PM DAISY® offers such functions as the complete recording and processing of orders for the truck-mounted concrete pumps, on-time billing and driver payroll bonus accounting. In addition, an integrated map system in connection with GPS (Global Positioning System) makes it possible for itineraries to be planned and visually displayed. Even hundreds of miles away, the headquarters therefore has precise information about the present site or set-up location of its trucks. Since this time, the bulk of the 1,700 registered truck-mounted concrete pumps in Germany are managed using PM DAISY® XP. Furthermore, approximately 15 % of all concrete pumps are linked to their central dispatch via the on-board computer.
The Swiss have always been technically ambitious, and not only when it comes to the accuracy of precision mechanical timepieces. Construction machine operators, too, have concrete ideas of what their machinery and equipment must be capable of delivering when used on construction sites between Basel and Lugano. The criteria, for example, are versatility, minimal space requirements due to the chronic restrictions in Swiss inner cities, and safety and simplicity in operation.

Betonpumpen AG had for a long time been interested in the TELEBELT® telescopic conveyors. The machines are built by the PM subsidiary, Putzmeister America. The specialists of a’ gained their first experience with a hired machine. In June 2006, the company put their very own, first TELEBELT® into service; a second would be delivered in August.

The TELEBELT® is a multiple-telescoping conveyor belt system onto which the conveyed material is transferred by a feed conveyor – there is one on-board. Three models are available (TB 80, TB 110 and TB 130) with a horizontal reach of 24 m, 32 m and 38 m respectively. The telescopic conveyors are built on a 3 or 4-axled truck chassis. The near 45 cm wide conveyor belt of a TELEBELT® can – as with the pneumatic conveyors – transport every conceivable type of bulk material, horizontally or vertically, – be it sand, grit, crushed stone, compost, substrate for roofscaping, or relatively dry or lean concrete mixtures. But these machines are significantly more powerful (capacity max 250 t/h) and are even able to convey grain sizes of 100 mm. Their favoured applications are therefore to be found in civil engineering, dam construction, railway construction and horticulture and landscaping.

Incidentally, with the new TELEBELT® generation, the feed conveyor on the work site can be raised, swung to the side and lowered hydraulically by radio remote control (“active feeder”). With the older machines, the feed conveyor was “piggy-backed” by the main belt and set down to one side. In addition, the reversing function of a’ TB 110 is an interesting item of optional equipment. It allows the conveyor belt to be reversed, making it also possible to use the TELEBELT® for tasks such as clearing away old gravel or substrate materials.

Access all areas
One of the first times the new TB 110 of a Betonpumpen AG was put to work, things, as expected, had become crowded. The machine had to be set up in the middle of a residential area not far from the centre of Zürich. Cars would come to park on both sides of the busy street. Right in front of the construction site, a couple of metres of space was left free for the TELEBELT® and its “out and down” supports, which – in an extraordinarily space-saving manner – are only extended and lowered perpendicular to the direction of travel. As soon as the feed conveyor is lowered and the main conveyor brought into position, tipper begin to load the gravel - sometimes as big as a fist - onto the main conveyor. A hopper mounting prevents the material from dropping onto the road during the transfer.

The purpose of the gravel (approximately 60 m³) is to fill a cavity between the outside wall of a new build’s basement and the hillside at the back. The architect requested it not to exceed the capacity of these “curvy-alls” – a Betonpumpen AG had for a long time shown a keen interest in the TELEBELT® telescopic conveyors. The machines are built by the PM subsidiary, Putzmeister America. The specialists of a’ gained their first experience with a hired machine. In June 2006, the company put their very own, first TELEBELT® into service; a second would be delivered in August.

High-capacity telescopic conveyor belts TELEBELT® is a multiple-telescoping conveyor belt system onto which the conveyed material is transferred by a feed conveyor – there is one on-board. Three models are available (TB 80, TB 110 and TB 130) with a horizontal reach of 24 m, 32 m and 38 m respectively. The telescopic conveyors are built on a 3 or 4-axled truck chassis. The near 45 cm wide conveyor belt of a TELEBELT® can – as with the pneumatic conveyors’ – transport every conceivable type of bulk material, horizontally or vertically, – be it sand, grit, crushed stone, compost, substrate for roofscaping, or relatively dry or lean concrete mixtures. But these machines are significantly more powerful (capacity max 250 t/h) and are even able to convey grain sizes of 100 mm. Their favoured applications are therefore to be found in civil engineering, dam construction, railway construction and horticulture and landscaping.

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In Köln-Deutz, Hochtief Construction AG is converting the old exhibition halls on the banks of the Rhine into a modern office and media centre. While the historical brick façades have been retained, Cologne’s largest office project makes progress behind the outer walls. Both the coring of the old building and the excavation work require a combination of experience and instinct.

The concreting of the expansive, up to 1.5 metres deep foundations, walls and floors requires truck-mounted concrete pumps with a long working reach. Of the concrete’s 140,000 m$^3$ total volume, around one third is being placed by machines of BEKA-Betonförderdienst GmbH (Kerpen). BEKA is favouring the use of its new Putzmeister M 62 “six-arm” in the former exhibition halls. The machine is equipped with a large 200 m$^3$/h core pump, making the concreting of the formwork sections, which on this site have a typical volume of up to 1,800 m$^3$, a speedy process. An older M 52-5 offers occasional assistance.

A round of half of the gross floor space measuring over 200,000 m$^2$ has already been let to RTL, Europe’s largest commercial television broadcaster. The reason behind this is that the TV company would like to relocate the German headquarters of the holding company to the historical halls and gather under one roof its businesses scattered across several locations in Cologne.

The listed Rheinhallen 1 – 5 with their expressionist façades were built between 1924 and 1928 on the order of Cologne’s mayor of the time, Konrad Adenauer. Additional annexes were built in the 1970’s, but these have since been torn down as part of the modernisation work.
**Brutal concrete mixture**

**Following the completion of the Three Gorges Dam and commissioning of the 5,000 m high railway to Tibet, China now has everyone talking about another spectacular construction project.**

The Sutong bridge across the Yangtze River (also known as Yangzi) inspires so many superlatives that only the key facts need be listed here: its span makes it the longest cable-stayed bridge in the world. It has an overhead clearance of 62 m and is flanked by enormous pylons. Together with the approaches and departures, the 8,206 m long bridge construction, which rests on more than 140 pillars and was created using launching gantries, spans the Yangtze River, which can swell to a width of 14 km in places depending on the time of year. But to get to the point: the concrete placed here forces the concrete pumps to the very limits of their performance.

To allow the passage of container ships, a bridge section with a span of 1,088 m is freely suspended by two 306 m high pylons. The new bridge is located approximately 280 km to the east of Nantong and around 100 km to the west of the Yangzi estuary. In the highly industrial province of Jiangsu (approximately 74 million inhabitants), the 6-lane water crossing establishes a link between Nantong City and Changsha. The bridge construction was deemed a necessary investment given the annual 15% increase in the volume of traffic across the mighty river.

The pylons stand on sturdy concrete foundations, which are anchored in the bedrock 122 m below the river bed. Pontoon actions as working platforms are anchored around foundations for the duration of the construction phase. They are also home to the mixers and stationary concrete pumps.

Before delivery of the BSA 14000 HP-D high-pressure concrete pump, Putzmeister had promised that, with a delivery height of 310 m, the machine would still deliver 30 m$^3$/h through a 125 mm pump line. To this end, the BSA had been designed for concrete pressures of up to 260 bar. When a disproportional increase in hydraulic pressure at the concrete pumps was observed on reaching the 150 m mark, Putzmeister AG After Sales department and the Technical Management were called upon to intervene. After a minor modification to the concrete recipe, a reinforcement of certain concrete pump components under the most load, and the use of new generation hard metal wear parts, it was possible to resume the vertical delivery of the concrete.

The total costs of the Sutong bridge building project are estimated at around 6.45 billion yuan (approximately US$ 726 million). The work began in June 2003; completion is scheduled for 2009.

Grit, granite and a low w/c value

The pylons are made of an extremely dense reinforcement and high-strength concrete (C80). A great deal is expected of the concrete pumps in the task of delivering the concrete through the risers: the grading curve is unbalanced; the fines currently consist of open-pored, ground slag; a sharp grit is used for a grain size of 4 mm; the largest aggregates (5–25 mm) are made exclusively from extremely wear-promoting granite; and the w/c content even reaches the value of 0.34. Then mix in the various chemical additives and…

A boat ferries site personnel to one of the two pylons far out on the Yangtze. A model of the enormous Sutong cable-stayed bridge.
After the Nile and Amazon, the Yangtze is the third longest river on Earth. Its entire length of 6,380 km flows through the People’s Republic of China, 2,800 km of which are navigable. A population of around 350 million live along this mighty river. The Yangtze is suffering the consequences of the many cities along the Yangtze. Its official name in China is Changjiang (long river). The name by which it is known in Europe, the Yangtze, comes from the word Yangzi, which is used in Chinese only when actually referring to the estuary region of the Yangtze.

### Info on the Yangtze

The Yangtze is suffering the consequences of the many cities along the Yangtze. Its official name in China is Changjiang (long river). The name by which it is known in Europe, the Yangtze, comes from the word Yangzi, which is used in Chinese only when actually referring to the estuary region of the Yangtze.

Several sections of the gigantic river are so dirty today that the drinking water supply of a number of major cities along the Yangtze is suffering the consequences. The mighty river flows into the Yellow Sea north of Shanghai at a rate of 35,000 m³ every second.

Its official name in China is Changjiang (long river). The name by which it is known in Europe, the Yangtze, comes from the word Yangzi, which is used in Chinese only when actually referring to the estuary region of the Yangtze.

### Info on the cable-stayed bridge design

Construction engineer, Bernd Nebel, a recognised bridge building expert, explains the advantages of the cable-stayed design over other bridge building methods on his website: “The advantage of cable-stayed bridges over suspension bridges is that it is possible to do without cost-intensive back-anchoring by means of anchor blocks. With the cable-stayed bridge, the restraint cables outside the deck mass are simply secured directly to the deck. The mass of the deck at the shore span provides the counterweight for the main span. A cable-stayed bridge can be built on the open sea as the main gateway to a substantially longer multipurpose bridge. The absence of an anchor block and the simpler construction are the reasons why cable-stayed bridges are, generally speaking, less expensive than suspension bridges. The largest cable-stayed bridge in the world constructed to date is the Tatare bridge in Japan with a main span of 890 m. The constraining factor in the development of even longer spans and the crucial disadvantage of the cable-stayed bridge are the difficult, static conditions during the construction phase. Cable-stayed bridges are the world over constructed using the cantilever method. If the load-bearing framework consists of two pylons, the construction teams work from both sides simultaneously until the unsupported ends of the deck meet in the middle. The greater the main span of the bridge and the more the freely projecting deck has been completed, the more susceptible the superstructure is to cross-wind. Even a moderate wind can agitate the unsupported end into vibrations putting it at serious risk.”

### Technology

#### Longer reach and more construction sites

– those are the decisive plus points characterising the M 38-4 “Z fold boom” that Putzmeister has developed for special markets. Construction firms mainly in Eastern European countries, but also in France and Switzerland, have expressed a keen interest in the 10-metre class. The machine is fundamentally based on the boom design and base structure of the M 36-4 “Z”, which has been manufactured in large-scale production at PM for many years. Depending on the make-up of the vehicle fleet of a concrete pumping service and the content of the competition’s vehicle pool, the M 38 assumes the position of flagship in a number of markets. The M 38 “Z fold boom” is built on a 3-axled chassis as standard. In the 4-axed version (option), the machine has considerable weight reserves for carrying extra pipes and delivery hoses. At the same time, the shorter wheel-base helps to improve the manoeuvrability of the track-mounted concrete pump.

The 4-axed version was chosen, for example, by the French pumping service, Atlantique Pompe à Béton (APB). From the corporate seat in Lorient, owner Patrick Boisbunon counts the whole of Brittany within his catchment area. In this region with a surface area of approximately 27,000 km² and almost 3 million inhabitants, APB uses a total of six truck-mounted concrete pumps in the 20 and 30-metres class as well as a PUMI® truck mixer concrete pump.

Concrete placement in the back yard

Patrick Boisbunon drives the new M 38-4 himself. For this afternoon, he has been summoned to the centre of the town of Quimperlé. He is already familiar with the construction site from previous visits. In the busy traffic, he sets up the machine in front of the house and is relieved once more that his M 38 is equipped with one-side-support (OSS). The truck-mounted concrete pump is needed in the restoration of an annexed building in the rear courtyard, the roofs of which spread over three floors – had to be removed first and are now going to be replaced with new ones. Today, the floor on the top level is being poured out with fine concrete (grain size 0/5 mm).

From the main road, Patrick Boisbunon controls the quadriple-jointed “Z fold boom” past the chimney of the street-facing house and over the ridge of the roof at a height of approximately 11 m. He then angles the “C” and “D” arms downwards towards the courtyard and, by gently lowering the boom sideways to and fro, manoeuvres the end hose into a position in which it can be pulled through the window opening by the members of the construction team. Within a few minutes, the 4.5 m³ of fine concrete is distributed on the floor surface measuring barely 50 m². To make it easier for the concrete hose to be swung by hand, Monsieur Boisbunon had exchanged the ND 125 end hose for an ND 100 hose in advance and connected it using a reducer on the boom delivery line. As efficiently as the M 38 was set up and made ready for use, the pipeline was cleaned with a sponge ball and the boom brought into the transport position. It was already time to depart for the next construction site of the day.

Above and beyond the roof of the main building on the street, Monsieur Boisbunon controls the placing boom of his M 38-4 through the window of the adjoining building.

Placing concrete in the floor of an old building

The catchment area of the Yangtze with the Three Gorges Dam on the upper course, and the Sutong Bridge out far from the centre to the Yellow Sea.

The catchment area of the Yangtze with the Three Gorges Dam on the upper course, and the Sutong Bridge out far from the centre to the Yellow Sea.
Small pin for great effect

The fact that concrete is often, or frequently has to be, pumped through extended hose and pipelines was demonstrated by a few examples in this edition of PM Post. Putzmeister AG expressly points out that the use of lever couplings, e.g., with the SK standard coupling system and the PX hoseline system, demands that the tension levers be additionally secured against inadvertent release by means of a spring pin (cotter pin).

It is not that this precaution is a necessary to prevent couplings from being released unintentionally as a consequence of the concrete pressure that builds up in the line. This risk is practically eliminated as soon as the coupling lever is forced beyond the dead point. The machine operator is not able, however, to prevent the hoseline from moving during operation and, for example, being caught on reinforcements. An unwanted counter-

movement, and the tension lever opens. The consequence is an uncontrolled concrete stream that gushes out of the line with a pressure of 85 bar and that may cause disastrous damage to property and devastating personal injuries.

For safety reasons, therefore, experienced machine operators will carry a few more spring pins on-board as spares than are actually needed. For not only do the spring pins secure the couplings of the extension lines, they are also a requirement for the couplings of the boom pipework. Fitting the cotter pin only takes a matter of seconds. In the interests of risk-free operation, any safety-conscious machine operator would take the time to ensure this is done.

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Practical Tip

Small pin for great effect

Only with a spring pin are lever couplings really secure!