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Photo by Tom Bell HW-050606 D16

Skanska's GP-4000 with two-lift paving system, IDBI and stringless control system slipforms a new highway in the Czech Republic.

Introducing a New Slipforming System to the Czech Republic

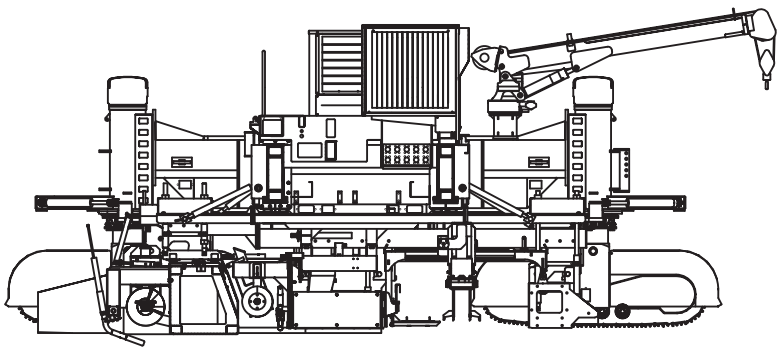
The Czech Republic is undertaking a massive road-building effort to improve the quality of the country's roadways. Several different projects are underway that will improve traveling conditions for local citizens, truckers and tourists.

Skanska DS a.s., based out of Brno, Czech Republic, has been at work on two of those major road-building projects, one on Highway D1 near Vyskov, and a second on Highway D11 near Hradec Králové. They'll be slipform paving a total of 58 km (36 mi) of new roadway by the time both projects are completed.

The Czech Republic also specifies two-lift pavement on some of their projects, or a roadway made up of two layers and two different concrete mix designs. It was a requirement on Skanska's first project, Highway D1. The typical method for two-layer pavement in the country requires two separate machines. A paver leads laying down the first layer of concrete, a placer/spreader follows spreading out the second concrete mix and a second paver follows behind paving the top layer of concrete with a mid-mount dowel bar insertion system.

Officials from Skanska had observed that version of two-lift paving and wanted a more efficient way for their project. They began discussions with GOMACO about a GP-4000 paver with a two-lift system incorporated on a single paver.

GOMACO's two-lift system fits underneath the paver. No extra extensions or paving machines are needed. It was a concept that intrigued Skanska, and they ultimately purchased a GP-4000 with the two-lift paving system for the Highway D1 project. The paver is also equipped with an In-the-Pan Dowel Bar Inserter (IDBI) and Leica stringless control system.



GOMACO's compact two-lift paving system with IDBI fits underneath the standard framework of the GP-4000 paver.

Highway D1: Praha–Ostrava

The new section of Highway D1 runs between Vyskov and Morice, and involved building 16 km (9.9 mi) of two-lane roadway. Specifications on the project called for a 200 mm (7.9 in) thick bottom layer with a 100 mm (3.9 in) thick top layer for a total thickness of 300 mm (11.8 in).

"The two layers are a general requirement for this highway," Josef Richter, Production/Technical Manager of Skanska, said. "The difference between the two concrete mix designs is mostly the size and quality of the aggregate. The upper layer has a maximum aggregate size of 22 mm (0.9 in), while the bottom has a maximum of 32 mm (1.25 in).

"The mix contains both air entrainment and plasticizers. Aeration is the basic requirement for frost resistance and to resist against chemical sanding."

One concrete batch plant was used for both concrete mix designs. Concrete was mixed at a 2:1 batching ratio, with two loads of the bottom concrete mix batched versus just one of the thinner top layer.

Concrete was hauled to the paving site by dump trucks with a hauling capacity of 25 tons. Trucks dumped directly onto the grade for the bottom layer or lift of the roadway. Augers on the front paving pan spread the material, vibration is applied consolidating the bottom layer and the second mold finishes the top layer of concrete.

An excavator running in front of the paver emptied concrete out of the trucks for the top layer. The excavator places the concrete into a specially designed hopper on the front of the GP-4000 paver. The concrete is conveyed from the hopper into a top-layer paving chamber and is spread with an auger across the width of the pavement. The vibrators in the top layer paving chamber run parallel to the face of the paving pan. Their placement ensures the top layer of concrete is properly consolidated without mixing it into the bottom layer of concrete and changing both mix designs. Vibrators placed along the width of the pan provide proper consolidation to the edge.

The two layers are slipformed simultaneously underneath the length of the paver. The arrangement guarantees a good bond between the two layers because of the freshness of the two layers of concrete.

Photo by Kelly Krueger HW-100408 D21

Photo by Tom Bell HW-050609 D3

The IDBI inserts 40 bars, 250 mm (9.8 in) apart, across the width of the paving pass.

Photo by Ken Tipple HW-100416 D9

The two-lift paving project near Vyskov required a 200 mm (7.9 in) thick bottom layer with 100 mm (3.9 in) top layer for a total roadway thickness of 300 mm (11.8 in).

Photo by Rafal Pigula HW-050617 D25

Skanska is achieving an average smoothness reading of only 2 mm (0.08 in) per four meters (13.1 ft) on the Planograph testing system, half of the project's 4 mm (0.16 in) specification.

Photo by Rafal Pigula HW-050619 D25

Paving production averaged 400 meters (1312 ft) per day while paving the two-lift project.

Photo by Kelly Krueger HW-100407 D19

An excavator was used to place the top layer concrete mix design into the paver's hopper. The bottom layer's concrete was dumped directly on the ground, in front of the GP-4000.

Photo by John Bowden HW-080603 D2

The GOMACO GSI follows the paver and measures the smoothness of the new roadway.

The IDBI is attached to the paver behind the second pan and inserts bars for the joints in the new roadway. Forty bars with a 25 mm (1 in) diameter and 500 mm (19.7 in) length were inserted every six meters (19.7 ft) across the width of the pavement. The bars were placed 250 mm (9.8 in) apart and 150 mm (5.9 in) deep into the slab.

"The bar placement accuracy was perfect," Richter said. "Checks were conducted to test the accuracy of the placement and the tests showed good results every time."

Paving widths varied between 10.75 meters (35.3 ft) and 12.25 meters (40.2 ft) depending on project specifications. Producing the two different mix designs from a single plant with double drums limited their daily production, which averaged approximately 400 meters (1312 ft) per day.

Highway D11: Praha–Hradec Králové

Skanska's second project with their GP-4000 has them at work building 42 km (26 mi) of Highway D11 connecting Hradec Králové to Podûbrady in the Czech Republic. Skanska removed their two-lift paving feature, but left the IDBI on their paver. It was just a matter of removing the first lift or the bottom paving pan of the two-lift system.

Bar insertion requirements are similar to the D1 project. Forty bars are inserted 120 mm (4.7 in) deep into the new roadway every six meters (19.7 ft).

The Leica 3D machine control system is once again at work on the project. Two prisms are mounted on the paver, which are tracked by Leica robotic total stations. The total stations constantly feed machine position coordinates to the 3D controller via a radio link. The paver is also equipped with front and rear slope sensors which measure the machine's cross slope. The information from the total stations and the slope sensors is used by the 3D controller to calculate final machine position and orientation, and in turn feed control signal information to the main machine controller.

Three total stations are at work on the projects. Two are used to guide the paver while the third total station conducts as-built checks behind the paver. The as-built checks measure the line and level of the new concrete

roadway and provide instant feedback on the accuracy of the new slab.

The third total station can also be used for leap frogging, which is the process of switching from one total station to the next when one becomes too far away from the paver.

"The system is very modern and an effective method eliminating the human factor influencing the classical 'stringline guidance' method," Richter said. "It is very economical and effective and we want to apply it to all of our pavers."

Smoothness of the new roadway is always a concern during the slipforming process. The project specifications required a ride of only 4 mm (0.16 in) per four meters (13.1 ft) on a Planograph testing system. Skanska's average ride came in under the spec by half. They're averaging only 2 mm (0.08 in) per four meters (13.1 ft).

This is Skanska's first project with their new GOMACO Smoothness Indicator® (GSI). The GSI follows directly behind the paver and is constantly monitoring the concrete slab for any bumps that may affect the smoothness. If a bump is detected, Skanska has the option of going back and fixing that bump while the concrete is still in the workable stage.

"It's definitely helping us achieve a better final smoothness reading because it allows us immediate reaction to any unevenness of the concrete during the slipforming process," Richter said. "We are anticipating eventually using it for measuring our grade to ensure everything is correct before we begin paving."

Skanska continues to slipform new roadway in the Czech Republic with their GOMACO equipment. Slipforming has been a learning process for the company and the clients they work for, but their success is overcoming any skepticism.

"People here are used to different work procedures, concrete formulas, and technologies and this applies not only to Skanska's managers and employees, but also to people in the investors' teams, supervisors and engineers," Richter said. "Influencing those initial factors required a lot of effort, enthusiasm of leaders, and gradual steps in promoting the new technical elements and procedures. I am convinced that we have been successful in it and thanks to close cooperation with GOMACO, we are overcoming the natural resistance to new things."

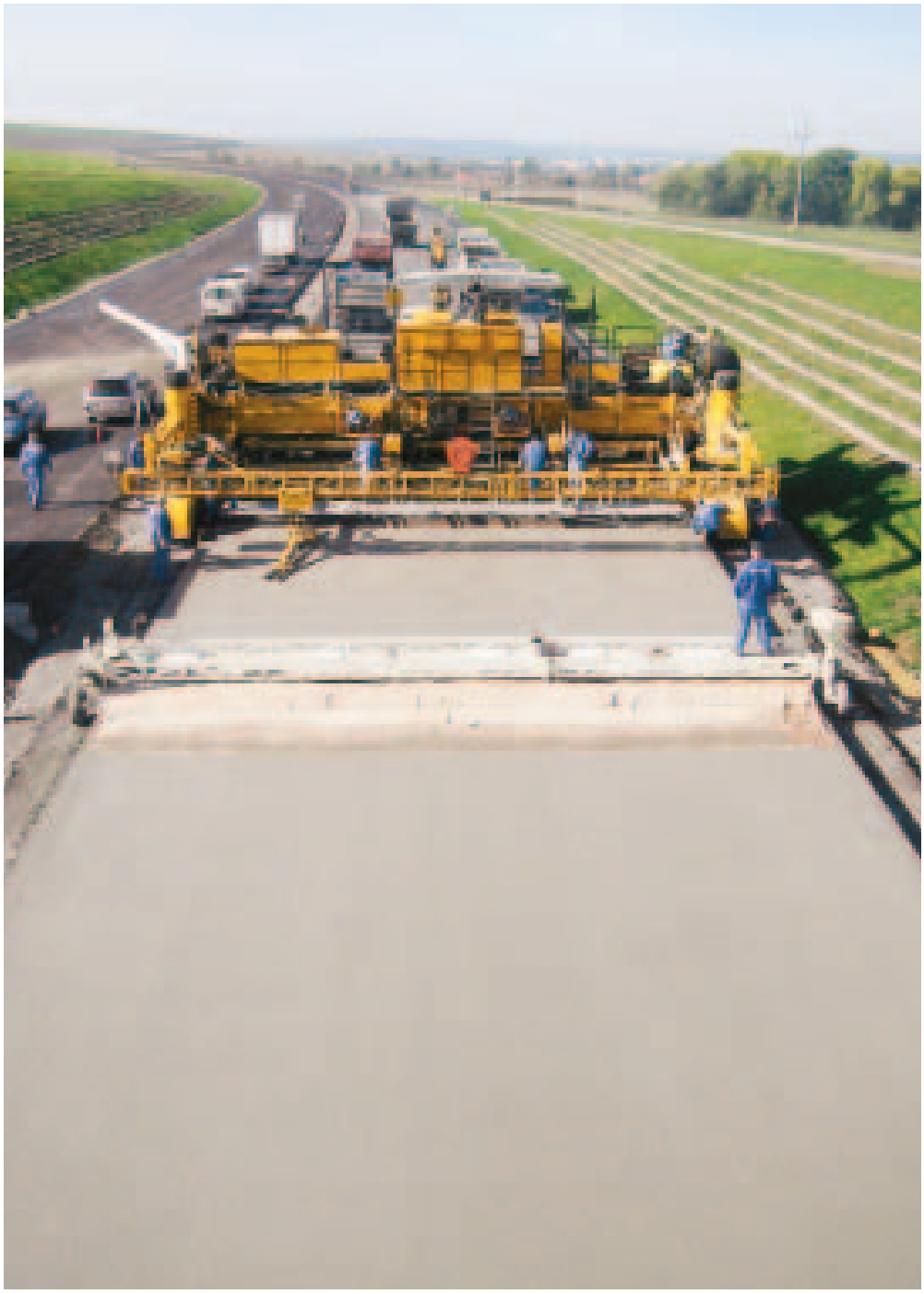


Photo by John Bowden HW-110419 D15

Photo by John Bowden HW-080604 D19

Photo by Tom Bell HW-050608 D27

Skanska and their GP-4000 with IDBI is currently at work slipforming 42 km (26 mi) of Highway D11 connecting Hradec Králové to Podûbrady in the Czech Republic.

Photos by Paul Mc Lannon CG-100612 D22

The Commander III is performing triple duties... flat slab, feed bunk and roadway on a cattle feedlot project in Australia. It's slipforming the flat slab in the above photo.

Commander III Versatility Rocks!

No, it's not another Elvis sighting in Australia. The King of Rock and Roll has not returned from the dead. This Elvis is a GOMACO Commander III that is slipforming to an audience of over 100,000 cattle and sheep on the 16,000 acre Yambinya Feedlot Tasman Group Services in Burraboi, New South Wales, Australia. Elvis, the Commander III, earned its nickname from its slipforming crew because, according to them, it rocks.

DMC Concrete Developments, based out of Melbourne, bought their Commander III after seeing one at work in a television documentary. They found the idea intriguing and researched slipform pavers in general before deciding on the Commander III.

"I saw this on TV and it blew me away seeing what could be done with these machines," Dom Cimino, Director of DMC Concrete, said. "I knew we could apply it to our business, so we did our research and we found the right company with the right equipment. The Commander III is the perfect machine for our workload. We call the machine Elvis, because it rocks all day long!"

DMC Concrete specializes in concrete buildings, factories, concrete panels and feed bunk. They put their new machine to work on the massive project at the Yambinya Feedlot. By the time they complete the project next year, they'll have slipformed approximately 15 km (9.3 mi) of both flat slab and feed bunk, and 13 km (8.1 mi) of six meter (19.7 ft) wide roadway. All of the work is carried out within the extreme conditions of the feedlot.

"We do a lot of feedlot work, but this project is the first time for us slipforming in this large of a scale," Cimino explained. "It wouldn't have been possible without my partner, Sam Barbirotto. Sam has taken this project on and is making it a success."

The Commander III's first application on the feedlot was a nine meter (29.5 ft) wide, 150 mm (5.9 in) flat slab. On one side of the slab, feed trucks drive along and pour feed into the bunks. On the other side of the slab, cattle stand and feed on the clean surface of the concrete.

The slab is slipformed on a laser cut and graded sand and limestone subgrade. DMC's own concrete trucks deliver 6 m^3 (7.8 yd^3) loads of concrete to the paver and dump right on the grade. Their batch plant is located on site and is capable of producing 250 m^3 (327 yd^3) of concrete per day, which limited their daily slipforming production. Slump averaged 70 mm (2.75 in).

The heat and feedlot conditions created additional challenges to the mix design.

"The heat was unbearable and the mix design would change up to six

CG-100622 D16

The Commander III slipforms feed bunk at the Yambinya Feedlot in New South Wales.

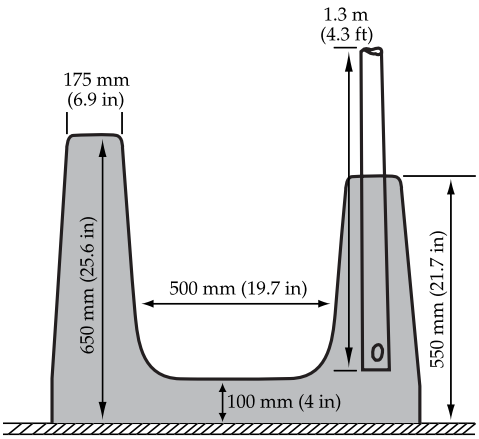
times a day because of extreme conditions," Cimino said. "We also were adding an air mixture that was needed for durability. The additive keeps the concrete from absorbing the cattle's urine and helps cut down on the feedlot smell. It also stops the urine from eating into the concrete, which reduces the chance of disease for the cattle."

The slabs were given a roller dimple finish to help create traction and grip for the cattle. The finish is applied behind the paver by a worker who used a roller with the dimpled pattern on the freshly slipformed concrete. Joints were hand cut into the slab every six meters (19.7 ft).

With the concrete flat slabs finished, work could begin on the feed bunk portion of the project. The profile was a challenging one.

The base of the feed bunk is 1000 mm (39.4 in) wide with one side wall 650 mm (25.6 in) tall and the other 550 mm (21.7 in) tall. The sidewalls are both 175 mm (6.9 in) wide. The right sidewall also has to be able to withstand the insertion of a pole that eventually helps form a fence across the top half of the feed bunk.

The feed bunk mold was built with a specially designed hydraulic pole inserter that allowed on-the-go bar placing. The inserter features a carriage mechanism that allowed the inserter to be able to move backwards in relation to the forward travel of the Commander III. This allowed the machine to be moving forward, even when inserting a pole and not causing any damage to the side of the bunk because of the forward movement of the Commander III.



A *drawing illustrates the dimensions of the new feedbunk.*

CG-100622 D1

Once the project is complete, they'll have slipformed 15 km (9.3 mi) of flat slab and feed bunk with the Commander III.

CG-100622 D17

The feed bunk mold has a hydraulic pole inserter mechanism that allows finishers to insert 1.3 meter (4.3 ft) long poles into the sidewall of the new feed bunk on-the-go while slipforming.

Dom Cimino, Director of DMC Concrete, said, "The Commander III is the perfect machine for our workload. We call the machine Elvis, because it rocks all day long!"

The 1.3 meters (4.3 ft) long by 75 mm (3 in) diameter poles were inserted 450 mm (17.7 in) down inside the sidewall. They are placed at three meter (9.8 ft) intervals. Joints are hand cut every three meters (9.8 ft).

"The most challenging aspect of the feed bunk was just getting the right mix design for the machine," Cimino explained. "We added a lot of air and plasticizer which made the slipforming run smooth and the end result was a smooth finish."

DMC was confident their Commander III could handle the feed bunk challenge. They didn't even attempt a test pour, they just put the machine on line and started slipforming.

"We just went for it," Cimino said. "The feed bunk looked great and we had very little touch up work, and that was just around the posts. This Commander III unit never missed a beat under these extreme conditions and that's considering everything else on the farm breaks down from the heat."

Production is averaging 385 meters (1263 ft) per day with their best days reaching 450 meters (1476 ft). The biggest trick is keeping the slump of the concrete constant. DMC likes to keep their concrete slump for the feed bunk at 20 mm (0.79 in).

The project's remote location also made it necessary to have their own plant at the feedlot. An on-site plant also gives DMC the ability to constantly monitor the quality and slump of their concrete, even with the changing temperatures.

"It would have been so much simpler if we didn't have to worry about the supply of concrete, but in the middle of nowhere, you have no choice," Cimino said. "We are bringing in water, aggregate and cement all of the time and we constantly have to test our concrete. Setting up our own concrete plant with six concrete trucks has been extreme.

"But it also gives us the ability to tweak the concrete to suit. We have slipformed in 50ºC (122ºF) weather and the machine never faulted. If you get the mix right, the machine rocks day and night."

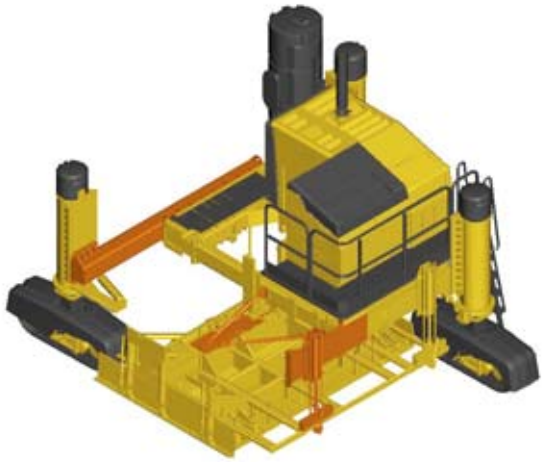
The third application the Commander III will be slipforming within the Yambinya Feedlot is a new, private ranch road approximately 13 km (8.1 mi) long. The road will be six meters (19.7 ft) wide, 200 mm (7.9 in) thick and will be slipformed in two paving passes.

DMC Concrete has been at work on the feedlot for the last two years. Cimino figures they have another year of work there before they are completely finished with all facets of the project. The Commander III has been there for the last year and has been working exceptionally well for the company.

"We are a very, very happy customer," Cimino said. "This machine advanced me to another level in my work. My guys get so tired doing really nothing most of the day but watching it work. The machine just rocks all day."

CG-100611 D16

The flat slab has a roller dimple finish to help the cattle create traction and grip on the concrete.



The drawing illustrates the Commander III's unique three meter (9.8 ft) undermounted mold.

CG-100612 D11

CG-100612 D5

DMC Concrete's Commander III three-track is equipped with a three meter (9.8 ft) wide paving package to slipform the flat slab and the feedlot's 13 km (8.1 mi) of new roadway. They say the Commander III is the perfect machine for their workload.

Paving Roadway Through Two Tunnel Projects in Japan

Two Japanese contractors have been hard at work paving the roadway through two tunnel projects within their country. Both of the tunnels are located on the Meishin Highway in central and western Japan.

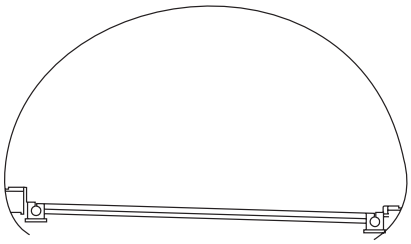
Typically, tunnel roadways are handformed in Japan. It was always a concern to be able to keep half of the tunnel's width open to construction traffic and machinery. Half-width slipform paving is gaining popularity though, and the successful completion of these two tunnel projects is helping the process make even more progress.

Both projects have been slipformed with GOMACO Commander III pavers. Its size and versatility is perfect for the tight working conditions inside a tunnel.

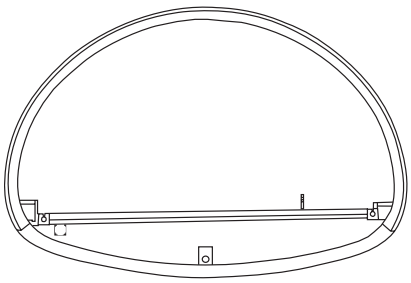
The first project, Suzuka Tunnel Paving Work of the Second Meishin Highway Road, is located between Kameyama City, Mie-Ken, to Koga City, Shiga-Ken. The project is a joint venture between contractors Taisei-Rotec Corporation and Fukuda Road Company Ltd. Taisei-Rotec used their RTP-500 rubber-tracked placer and their four-track Commander III to slipform 114,000 m^3 (149,106 yd^3) of new concrete roadway over continuous steel reinforcing. The road was completed in two paving passes, which allowed half of the tunnel's width to remain open to construction traffic at all times.

The second project, Rittou Tunnel Paving Work of the Second Meishin Highway Road, is located by Rittou City, Shiga-Ken. The project was a joint venture between Nihon Road and Okumura-Gumi Civil Engineering Company Ltd. K-Con Company Ltd. was the contractor responsible for the concrete slipform work.

K-Con used an RTP-500 and a four-track Commander III to slipform approximately 52,000 m^3 (68,013 yd^3) of new tunnel roadway over continuous steel reinforcing.



Rittou Tunnel Profile



Suzuka Tunnel Profile

Photos courtesy of Taisei-Rotec Corp. & K-Con Company. HW-060712 D6

A Commander III slipforms roadway out of the Rittou Tunnel on Meishin Highway Road in Japan.

HW-060712 D1

A Commander III slipforms the new roadway through Japan's Suzuka Tunnel project.

HW-060712 D2

The RTP-500 has an extended truck pusher to accommodate the specially-designed concrete trucks working in the tunnel.

34 Paving Passes for a GHP-2800 at the Charles de Gaulle International Airport

Photos courtesy of GOMACO International Ltd. HW-020703 D7

Betonac slipformed 44,000 m² (52,625 yd²) of concrete apron at the Charles de Gaulle International Airport in France.

Betonac nv in Sint-Truiden, Belgium, has always been concerned about producing quality slipformed concrete. It's a source of company pride and something they work very hard at. They've implemented the use of several features to help maintain quality, including slipforming with GOMACO pavers, operating their own concrete batch plant, and using a paver-mounted GOMACO Smoothness Indicator® (GSI).

All of these features, combined with a knowledgeable crew, have given Betonac an edge on their slipforming projects. They recently left their home country to take on their first project abroad at the Charles de Gaulle International Airport near Roissy, France, 25 km (15.5 mi) northeast of Paris.

They slipformed 44,000 m² (52,625 yd²) of concrete apron for a new parking lot for FedEx® freight planes to load and unload. They were also responsible for slipforming a transitional concrete slab between the new apron and an existing roadway.

Restrictions for working at the international airport, the second busiest in terms of both passenger traffic and cargo traffic in Europe, were very tight. Decisions had to be made about what equipment and what personnel would be working on the site. Applications had to be filled out and turned in before work began and no substitutions throughout the course of the project would be allowed.

"Everyone who worked on the job site had to show a badge and we had a limited number of badges at our disposal," Felix Boulez, Betonac's CEO, explained. "The choice of who would apply for one had to be made very cautiously. The same was true for our vehicles. A regular group of staff and equipment would work from the beginning to the end of the job without any possibility of change, not even for employee illness or equipment breakdowns."

They knew their four-track GOMACO GHP-2800 paver was up to the challenge and it was added to their equipment list. They also included their four-track Commander III to pave the transitional slabs and a GOMACO T/C-600 texture/cure machine.

Their GHP-2800 is equipped with the Leica stringless guidance system, Minnich Auto Vibe III smart vibrator monitoring system, a GOMACO Auto-Float® and a paver-mounted GSI. All are features that help Betonac slipform

the best pavement possible.

The new apron is approximately 300 meters (984 ft) long, 170 meters (558 ft) wide and 400 mm (15.7 in) thick. It was slipformed in 34 passes with the GHP-2800 paving five meters (16.4 ft) wide.

Concrete was supplied by Betonac's own batch plant capable of producing 120 m^3 (157 yd^3) of concrete per hour. The mix design was a standard paving mix with air entrainment and plasticizer added. Slump averaged 20 mm (0.79 in).

"The design of the concrete is important and influences our ability to get a smooth finish," Boulez said. "It should be homogeneous during the whole job so we don't have to make any changes to the slipform paver. That is why Betonac prefers to produce our own concrete."

Trucks each carrying 12 m^3 (15.7 yd^3) loads of concrete transported the material to the paver. The trucks dumped into a holding container and an excavator placed the concrete in front of the GHP-2800.

Production averaged 100 m^3 (131 yd^3) per hour or 1200 m^3 (1570 yd^3) during a 12 hour paving shift.

"We worked under the capacity of the plant, because we wanted to be able to pave continuously," Boulez explained. "Paving speed influences smoothness and is very important. It has to be tuned to the supply of concrete. A speed has to be found that ensures the supply does not get too far ahead of the paver, but also allows the paver to slipform constantly, without starting and stopping."

The Auto Vibe III system on their GHP-2800 allows them to constantly monitor the vibrators' output. It is another one of Betonac's quality controls and the system pinpoints any vibrator that is not working properly. The system also monitors and controls all vibrator functions.

Betonac has also left stringline behind on all of their major projects and has been paving exclusively with the Leica stringless system for over three years now.

"With the stringless system, we know that every meter is as the project should be," Boulez said. "With the 3D system, we need less space beside the paver because we don't need to allow extra room for the stringline, we have immediate control behind the paver, and we have greater accuracy and precision."

The Leica stringless system also has a mixed-mode paving configuration. It is especially helpful on airport projects where contractors are paving pilot lanes. For example, if a contractor is paving five lanes total, all adjacent to each other, typically they would pave lane #1, #3, then #5, leaving the gaps for lanes #2 and #4 to be filled in later. There has to be a smooth joint between the connecting lanes. The 3D mixed-mode paving feature allows the machine to be steered without having to set up any temporary stringline for the fill-in lanes. They can lock the paver to grade with the track legs to perfectly match the grade of the adjacent slabs.

"The mixed-mode paving feature is indispensable," Boulez said. "A primary strip is measured and this data is given to our study agency to make a draft of the adjacent strip. Often it was a strip adjacent to an existing strip on one side and free on the other side. In this situation, the mixed mode is indispensable to achieve a good result and was very useful at the airport."

Betonac uses three total stations in their stringless paving process. Two of them are constantly tracking and

HW-020703 D13

The T/C-600 texture/cure machine, equipped with a transverse curing mechanism, tines and cures in a single pass.

HW-020703 D16

The GHP-2800 paver-mounted GSI provides Betonac with a constant indication of pavement quality.

"We wanted a GSI to help us obtain maximum quality and to do that, we have to have a control on the smoothness during paving," Boulez explained.

measuring the prisms on the paver. A third total station is used to conduct as-built checks behind the paver. The checks, which are conducted every five meters (16.4 ft), measure the line and level of the new concrete apron and provide instant feedback on the accuracy of the new slab.

Betonac is always concerned about paving the best project possible and looking for ways to improve the paving processes. They have been using a paver-mounted GSI on their GHP-2800 since 2003. It provides them with a constant indication of their pavement quality and instantly alerts them to any potential problems.

"We wanted a GSI to help us obtain maximum quality and to do that, we have to have a control on the smoothness during paving," Boulez explained. "The GSI, with its bump alarm, alerts the operator when something is wrong. Everything can then be checked... the vibrators, the Leica system, any external factors that can disturb the work, and we can fix the problem. It gives us the ability to immediately react when there is an irregularity and gives us a chance to fix the problem with the Auto-Float or we can manually touch up the surface.

"We chose the paver-mounted GSI because we first wanted to learn the system, which went very well, before buying an extra machine. The GHP-2800 also has a stable frame to mount the GSI. Immediately after the mold, there is a control and an indication whether something went wrong and the concrete can be reworked right away."

The apron specifications included three meter (9.8 ft) wide by three meter (9.8 ft) square recesses that will eventually become fuel pits. Betonac had to create a way to slipform over the pits, without filling them full of concrete. They built a metal formwork that could be placed in each of the pits. It was filled with sand and covered with plywood. The GHP-2800 could simply pave over the top of the fuel pit, finishers could finish around the structure, and later, when the concrete had hardened, the formwork was removed.

The edge of each of the apron paving passes had an intricate keyway built into it. The sinusoidal (wavy or curvy) joint was necessary on the airport to help transfer the weight of the cargo planes from one section of apron to the next. The keyway is accomplished in the slipforming process with a special sideplate extension that has the configuration built into it.

Dowel bars were also hand-drilled and inserted every 305 mm (12 in) into the edge of the longitudinal joint. Longitudinal and transverse joints are every five meters (16.4 ft).

A GOMACO T/C-600 texture/cure machine followed the paver applying a transverse tine and a water-based transparent curing compound. Betonac's T/C-600 is equipped with a transverse curing mechanism, which allows them to cure and tine simultaneously in a single pass. In the absence of stringline, the T/C-600 is sensored off the slab. The operator manually steers while the sensor controls the level of the machine.

The transitional slab was paved with Betonac's four-track Commander III. The strip was 1200 mm (47.2 in) wide and had a variable thickness. It was 350 mm (13.8 in) thick tying into the concrete apron and tapered down to 150 mm (5.9 in) thick against the existing roadway.

"This was our first project abroad and it was our first airport project of this size," Boulez said. "Quality is very important to us and because we have the Auto Vibe III, GSI, stringless system and GOMACO equipment, we have complete quality control and everything under our own management. We are looking forward to completing more projects like this at home and abroad."

Their work is now complete on the parking apron and Betonac is gearing up for their next project at the airport. They'll be slipforming a 145,000 m^2 (173,424 yd^2) concrete apron for the Aeroport de Paris' new terminal project.

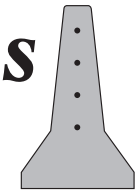
Betonac's GOMACO paving train completed 34 paving passes on the airport project. Each pass was 300 meters (984 ft) long, five meters (16.4 ft) wide and 400 mm (15.7 in) thick.

HW-020703 D15

Photos courtesy of Karl Soar CG-100630 D1

Doprastav is slipforming a 4 km (2.5 mi) long section of barrier wall on Slovakia's Motorway D1 without the use of stringlines.

GT-3600 & Stringless Barrier in Slovakia



The country of Slovakia is currently undertaking a massive road-building project to improve transportation within its borders and to surrounding countries. Slovakia is located in central Europe and borders the Czech Republic, Austria, Poland, Ukraine and Hungary. Part of the effort to improve transportation is centered around Motorway D1, running from east to west through the country.

It is currently 259 km (161 mi) long, but new construction in the next five years or more will increase it to 517 km (321 mi) in length. Doprastav, a.s., based out of Bratislava, Slovakia, is in charge of constructing segments of the new motorway, which includes a concrete safety barrier.

The company operates a GOMACO GT-3600 for curb and gutter work on their projects, and were looking for another GOMACO machine to slipform the 1100 mm (43.3 in) tall barrier. Once again, they chose the GT-3600, this time equipping it with a Leica PaveSmart 3D system for stringless barrier paving.

"We have a lot of experience with the GT-3600 by producing curb and gutter of various dimensions," Jozef Vondál, Producing Manager of Doprastav, said. "We decided to start slipforming barrier wall in May 2006 because we saw that it would give us more production and allow us to be more effective."

They put their new GT-3600 with stringless system to work on a 4 km (2.5 mi) long section of the new motorway by Zilina, connecting Vrtizer to Hricovské Podhradie. The barrier wall has a 685 mm (27 in) wide base and is 1100 mm (43.3 in) tall. Four 15 mm (0.6 in) diameter steel cables have to be inserted through the front of the barrier mold for reinforcement in the wall.

Incorporating the stringless guidance system into their project requires just a few steps. The engineer's design data for the project is converted into a surface model. That model is loaded into the Leica computer mounted on the GT-3600. The Leica computer is interfaced with the GT-3600's G21 controller.

At the start of each day, the GT-3600 is moved into position. The three Total Stations used on the project take measurements off predetermined reference points to orientate their position. They are then aimed at the prisms on the GT-3600 and they begin the tracking process.

CG-100630 D11

Two Total Stations track the GT-3600 as it slipforms barrier wall through a radius.

CG-100630 D16

The barrier wall has a 685 mm (27 in) wide base and is 1100 mm (43.3 in) tall.

The Leica computer immediately can tell whether the machine is positioned correctly and everything is set accordingly before slipforming the barrier wall.

Barrier wall requires careful machine control to keep the wall from collapsing in any conditions. The Leica PaveSmart system uses the Total Stations and slope sensors to continuously calculate the position, height and orientation of the machine as the GT-3600 slipforms the barrier wall. It automatically regulates all points of the machine relative to the project's 3D design data.

One Total Station is constantly measuring the front prism on the GT-3600 and is controlling the steering for the front of the machine. The second Total Station measures the rear prism and controls the steering and elevation on the back of the GT-3600. A dual-axis slope sensor on the GT-3600 also allows the slope of the machine, from front to back and side to side, to be constantly monitored and controlled.

The third Total Station is used for as-built checks and provides instant feedback regarding the accuracy of the new wall. The third instrument is also used for leap frogging. The Total Stations have a typical working range of 200 meters (600 ft) and a tracking accuracy of 3 mm (0.1 in) at 100 meters (300 ft).

The system is more accurate than traditional stringline, saves time, and allows for an open job site. Stringline is no longer required, so lines don't have to be measured out and set. Workers on the project don't have to worry about bumping the line or something happening to it that would cause an error in the slipforming. With no stringline to set, Doprastav can move anywhere around the job site. If one area is not ready to be paved, they can simply move the machine to a different area, orientate the machine to its location on the project, and begin slipforming wall.

The concrete mix design also has to be factored in for good barrier wall. Doprastav worked closely with their concrete supplier to develop a barrier mix. They took a standard concrete slipform mix design and added aerating ingredients. Slump averaged 20 mm (0.8 in).

Average production on the barrier wall was approximately 250 meters (820 ft) per day, with concrete supply being the limiting factor.

"Production is dependent on how well the concrete delivery is coordinated and once the concrete arrives, if the appointed mix design has been observed," Vondál said. "Once we have the right concrete, the GT-3600 works well and is very smooth and fluent."

Very little finishing work has to be done behind the GT-3600. Joints are saw cut into the cured wall every four meters (13 ft).

Doprastav's GT-3600 will continue to work on the D1 Motorway in the future. They have been awarded the contract to build the next section of the roadway as the country of Slovakia continues to improve its major thoroughfares.

CG-100630 D11

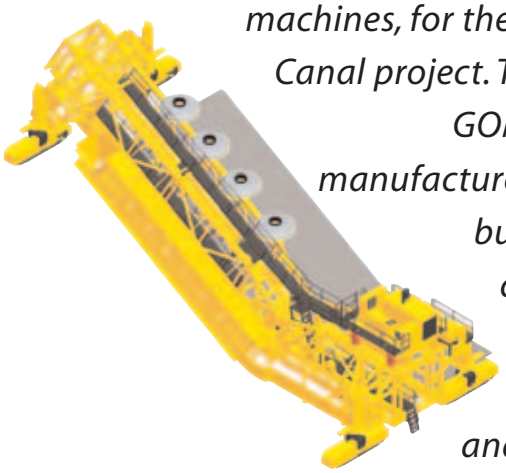
The GT-3600 is equipped with Leica's PaveSmart system for stringless paving.

EG-110601 D10

The paver and work bridge for the All-American Canal sits on the pier at GOMACO's testing facilities in Ida Grove, Iowa.

It's Not Your Ordinary Canal Paver...

Coffman Specialties needed canal paving equipment, three very specific and unique machines, for the All-American Canal project. They turned to GOMACO as their manufacturer of choice to build an all new canal slipform paver, water stop machine and work bridge.



EG-100618 D19

The All-American Canal in southern California delivers approximately 3.1 million acre-feet (382,379 ha m) of the Colorado River to nine cities and 500,000 acres (202,343 ha) of agricultural land. The 82 mile (132 km) long canal was originally constructed in the 1930s and 1940s. It begins at the Imperial Dam on the Colorado River, about 20 miles (32 km) northeast of Yuma, Arizona, and extends south and west, following the Mexican/American border.

The canal is currently unlined and substantial amounts of water are lost due to seepage, according to the Imperial Irrigation District, who operate and maintain the All-American Canal. They want to rebuild a section of the canal, with the new canal constructed parallel to the existing canal. The new concrete-lined canal will help minimize water lost because of seepage. Coffman Specialties, based out of San Diego, California, won the initial project bid to complete a portion of the new canal.

The All-American Canal Paver

Not Your Ordinary Paver – A quick look at any preliminary drawing of the All-American Canal paver will show you that this paver is not your ordinary canal paver. This canal will be a true slipform project. GOMACO built a canal slipform paver in the

EG-100631 D8

The All-American Canal paver features framework that is 10 feet (3 m) tall with a GP-4000 prime mover. It also has a powered wedge that allows the paver to be adjusted to the different angles caused by the changing widths and slopes of the canal.

EG-110602 D7

On the testing pier– the pier simulates the slope of the canal and allows engineers to test the different features on all three pieces of canal equipment.

late 1980s for the Coachella Canal project in southern California (*GOMACO World*, Vol. 17, No. 2). Coachella's new concrete lining was slipformed underwater with approximately nine feet (2.7 m) of water flowing in the canal. Much of the information learned on the Coachella project was incorporated into the All-American equipment.

A GOMACO GP-4000 prime mover will be set on top of a Coachella-style framework to provide the power plant and control system for the paver. The framework itself will be ten feet (3 m) tall. The mold sections are a 5000 series paving mold that has been modified slightly. The machine is mounted on four tracks... four very large tracks that are 13 feet, nine inches (4.2 m) long, 30 inches (762 mm) wide and 40 inches (1016 mm) high.

Supplying the Concrete – Placing concrete down the 40 foot (12.2 m) long, 1.75:1 or 2:1 slope and 25 foot (7.6 m) wide canal floor is a serious challenge. One

of the unique aspects of the paver is its concrete distribution system mounted to the front. Concrete trucks will dump into a standard GOMACO RTP-500 rubber-tracked placer which will then place the concrete into the distribution system on the paver.

The distribution system is basically a paddle system with baffles that run along the slope of the canal. The paddles move the concrete down the slope and the baffles collect the concrete to keep all of it from sliding down to the bottom of the slope. Vibrators are mounted transversely, rather than perpendicular to the mold. A spreader-plow, on the bottom 25 foot (7.6 m) wide section of the canal floor, will move the concrete across that width.

The canal's new lining will be four inches (102 mm) thick and will be slipformed in two paving passes.

Changing Widths and Slopes – The design of the canal itself presented an interesting challenge for GOMACO engineers while designing the paver. The slope of the canal is not constant and the length of the slope is variable. The paver has to be able to accommodate the changes as quickly and easily as possible.

Two different types of end cars are mounted to the framework of the paver - a fixed end car and an adjustable end car. The adjustable end car can be hydraulically slid in or out while the paver is stopped to accommodate the different slopes. It allows the length changes to be made without having to add or remove any sections of framework.

The other crucial feature is the powered wedge. When the length of the slope changes, it also changes the angle of slope on the canal and the pivot point on the paver. The powered wedge makes the machine adjustable to the canal's different angles.

Fracture Joints – The specifications on the canal require a longitudinal and transverse fracture joint every 15 feet (4.6 m). Four massive spools of cross-shaped, polyvinyl chloride rubber strips will be mounted to the paver. The material will be inserted by a specially designed inserting mechanism into the four inch (102 mm) thick concrete on the go, during the slipforming process. The longitudinal water stops will then create the canal's fracture joints.

"It creates a 15 foot (4.6 m) section for the concrete to fracture to allow for soil movement and other conditions," Jim Homan, GOMACO's project manager for the All-American Canal equipment, said. "Once the fracture takes place, the water stop is bound into the concrete slab and allows it to move and flex. It's also creating a seal that keeps water from leaking through the canal into the soil below."

The Water Stop Machine

The Transverse Water Stop – The second piece of equipment GOMACO has built for the All-American Canal paving train is the water stop machine. It follows directly behind the canal paver inserting the transverse water stop material every 15 feet (4.6 m). The production rate on the project is all dependent on this one machine and that created an extra challenge in the design process.

The inserter is made of eight foot by eight foot (2.4 x 2.4 m) frame sections, with the outside dimensions the same as the paver. It features a fixed and hydraulically-adjustable end car and powered wedge similar to the paver to match the canal profile.

The inserter is powered by an 80 horsepower (59.7 kw) engine and run on Series 6 tracks that are 16 feet (4.9 m) long with 20 inch (508 mm) polypads.

Inserting the Water Stop – The rubber water stop material will be inserted into the wet concrete by a specially-designed inserter mechanism that will ride on a carriage mounted to the frame. A large spool of the water stop material will also be attached to the framework. As the carriage moves down the canal wall, it will pull the water stop material off the spool and down the slope. At the bottom of the canal, a worker will anchor the material to the canal floor. The carriage, with the inserter mechanism, will then move up the canal wall opening up a trough approximately 1.75 inches (44 mm) wide by one inch (25 mm) deep and place the water stop material in the trough.

The top of the rubber water stop material is placed one-eighth of an inch (3 mm) below the surface to allow for controlled cracking in the canal. The process is repeated every 15 feet (4.6 m) along the length of the canal.

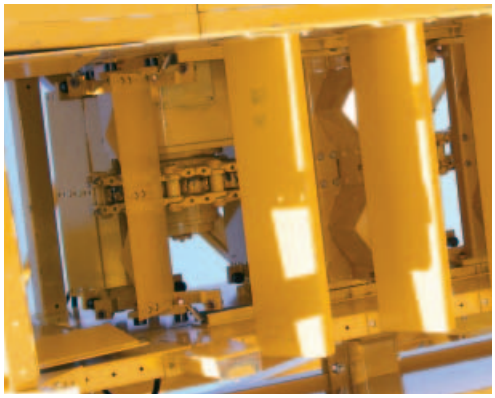
A 17 foot (5.2 m) long cylinder and float pan follows the inserter. The cylinder helps finish and seal the

EG-100606 D6

Modified 5000 series paving molds wait to be attached to the canal paver during assembly.

EG-100631 D30

Adjustable end cars on the machines hydraulically slide for width changes.



EG-110601 D16

A paddle system with baffles places the concrete down the slope of the canal.

EG-100606 D10

The spreader-plow moves the concrete across the bottom section of the canal floor.

surface of the canal.

The water stop machine has to be able to keep up with the paver so the concrete doesn't cure and become too hard to insert the material. That's one challenge. Another challenge is project specifications.

"This machine has to be able to insert a joint every three minutes to be able to pave five feet (1.5 m) per minute," Steve Johnson, GOMACO Project Designer, said. "If they can keep concrete in front of the paver for that kind of production, this machine is certainly capable of keeping up."

Extensive research and testing took place to create the insertion device. Not only does it have to place the material on-the-go in the paving process, but place it at the required depth, standing in the upright position, and with the concrete consolidated around the material.

"The concept itself is relatively easy," Homan explained. "But in the environment the inserter has to work in, the complications of going through a radius, and other aspects make this an interesting challenge and this a very important machine in the canal paving process."

The Canal's Work Bridge

The Work Bridge's Unique Design – Like all the machines for this project, the work bridge is a unique design with several different aspects to it. It mirrors the paver and water stop inserter in several features to match the changing dimensions of the canal, including a fixed and hydraulically-adjustable end car and powered wedge.

The console on the canal's work bridge will be similar to the one used on the water stop inserter. The continuation of the same components on the different canal machines helps out in the field with operation and maintenance.

The framework itself is four feet (1.2 m) wide by seven feet (2.1 m) tall, with the console located at the bottom of the machine. It will run on Series One tracks equipped with 17.7 inch (450 mm) rubber track pads. During the second paving pass, the machines will be running on the concrete from the first pass. The extra large track pads will keep the work bridge from cracking or marring the surface of the new canal.

An Auto-Float® will be mounted to the back of the work bridge and will finish while working up the slope. It will lift off the concrete, cycle back down to the bottom of the canal and complete another pass.

Testing the Equipment

New Canal Assembly and Testing Site – The final phase of the equipment's design and manufacturing was full machine assembly. GOMACO has constructed a new canal assembly and testing site at their company headquarters in Ida Grove, Iowa. The site includes a new concrete pier that is 16 feet (4.9 m) tall, 60 feet (18.3 m) long, and 72 inches (1829 mm) wide. It can accommodate almost any size canal paver, as the All-American Canal equipment has proven.

Each piece of the equipment was fully assembled and then placed on the pier so engineers could test its various features and performance capabilities. The canal equipment was later disassembled and shipped. Over 20 truckloads were needed to transport all of the canal paving equipment to California.

EG-040707 D3

The powered wedge system allows the machines to go from flat to varying degrees of slope.

EG-040707 D10

A 17 foot (5.2 m) long finishing cylinder with float pan will finish and seal the surface of the canal.

EG-040707 D15

The water stop inserter machine has a specially designed inserter mechanism to place the rubber water stop material into the concrete every 15 feet (4.6 m) to form the transverse joint.

New GOMACO Technology Introduced at

CV-040712 D4

Contractors and guests from around the world visited the GOMACO stand at Bauma 2007 to see the newest machine innovations.

CV-040713 D29

Vinayak Rege (left), GOMACO's Service Representative in India, explains canal paving to a potential customer from Pakistan.

CV-040714 D4

Representatives from B.R. Goyal met with Andy Linham (second from right), GOMACO Area Manager for India. Goyal recently purchased the first two-track GP-2600 sold in India.

CV-040711 D19

A view down the main aisle of GOMACO's stand at Bauma in Munich, Germany.

CV-040714 D26

Kent Godbersen, GOMACO, (left) and Michelle LeCompte of LeCompte stand in front of the company's new GT-3400 on display in the stand.

CV-040713 D1

From left, RJ Bumann, GOMACO Controls Software Engineer, and John Bowden, GOMACO International Ltd. Technical Sales Manager, discuss the new G22 control system with contractors from Poland.

CV-040710 D28

The Commander III four-track on the Bauma stand.

CV-040713 D26

Kent Godbersen (from left), GOMACO's Vice-President of Worldwide Sales & Marketing, and Rory Keogh, GOMACO International Ltd. Managing Director, discuss equipment needs with representatives from Turkey.

CV-040714 D18

A delegation of contractors from Cámara Chilena de la Construcción A.G. of Chile were guests in the GOMACO booth at Bauma 2007.

CV-040712 D14

Representatives from Apolodor visited the GOMACO stand to see their new GT-3600 on display. Their GT-3600 will be the first GOMACO slipform machine to operate in Romania.

Bauma '07

Bauma 2007 was an exciting show for GOMACO. We introduced the new GT-3400 internationally with two of the new machines in our stand to showcase its right-side and left-side curb and gutter slipforming capabilities. The right-side pour GT-3400 also featured the latest in Leica's stringless curb and gutter technology, the PaveSmart 3D system. The system incorporates both Total Stations and a GPS unit for grade and steering accuracy on GOMACO curb and gutter machines.

Both of the GT-3400s and the Commander III featured the powerful new G22 digital controller, with dual-language option. The option is available in both English and the customer's language of choice. GOMACO's control systems team can develop the G22 for all the major languages of the world. The G22 also has an easy to understand graphical display with colored pictograms depicting the machine's functions. Fourteen function buttons with bright, colored graphics provide the ultimate user-friendly operator experience.

A GT-3600 in the GOMACO stand featured Topcon's new stringless Millimeter GPS™ control system. Topcon's system incorporates GPS technology to guide GOMACO equipment without the use of stringline. The GT-3600 was set up with a step barrier mold, a profile of wall that is quickly becoming the standard profile in Europe.

"It appears this is the best Bauma show ever for GOMACO," Gary Godbersen, GOMACO President and CEO, said. "We enjoyed talking with contractors from around the world, discussing their upcoming projects and helping them find the solutions for their slipform paving needs."

As a show, Bauma 2007 was a record-setting event. A total of 200,000 tons of freight was moved in by 6000 trucks for the Munich, Germany, show. More than 500,000 visitors walked the show grounds and visited the stands of the 3041 exhibitors during the week-long show. One hundred and ninety countries were represented at Bauma 2007.

Commander III: The Contractor's Choice

for both Concrete Pavers and Curb and Gutter Machines

The GOMACO Commander III has been named the "2007 Contractor Choice" by *Roads and Bridges* magazine. The Commander III earned the magazine's gold award distinction for both concrete pavers and concrete curb and gutter, making both the three-track and four-track machine the choice of concrete contractors.

Roads and Bridges had asked manufacturers and service providers to nominate products to be eligible for the second annual Contractor's Choice awards. An expert panel of judges reviewed all the nominations and a ballot was formed and delivered to more than 22,000 contractors subscribing to the magazine. Contractors in this segment were eligible to vote for the best equipment on the job site and their choice was the Commander III.

GOMACO was also named the #1 Brand Leader for the categories of curb and gutter machines and slipform pavers by *Concrete Construction* magazine. Contractors who participated in the survey ranked the GOMACO name first in brand familiarity, and first in the brand used in the past two years. The magazine, whose publisher sponsors the World of Concrete show each year, surveyed contractors from their circulation. The sampling was divided into four regions of the United States: Northeast, Midwest, South and West, to get the fairest representation.

Better Roads magazine also recognized not one, but two GOMACO products in their Top 50 Rollouts. The variable width V2 mold and GSITools™ software application for use with the GOMACO Smoothness Indicator® (GSI) each earned the top honor. Each year, *Better Roads* magazine reviews all product introductions made over the past year, and picks out the 50 with the most significance to highway and bridge professionals. Priorities for inclusion are new concept products and new generation products.

GOMACO has been recognized as a "Patriotic Employer" by the National Committee for Employer Support of the Guard and Reserve. The award is for contributing to national security and protecting liberty and freedom by supporting employee participation in America's National Guard and Reserve force. The program recognizes employers whose support and good will are important to retaining highly skilled and qualified members of the Guard and Reserve.

Book Your Trip to CONEXPO-CON/AGG 2008 Today to Guarantee Rooms and Airfare!

CONEXPO-CON/AGG 2008 will be March 11-15, 2008, in Las Vegas, Nevada. If you plan on attending, you need to be reserving your plane tickets and hotel rooms now. There are a number of other shows and sporting events all happening in Las Vegas at the same time, making rooms and flights in and out of the city a premium item.

You can register for the show and even make your domestic or international travel plans, car rental and hotel reservations right from the show's site, just visit http://www.conexpoconagg.com/Attendee/overview and the website will help walk you through the process.

GOMACO will be in Booth #C-5657 in the Central Hall of the Las Vegas Convention Center. We can't wait to see you there to discuss your concrete paving needs for 2008!

CG-100509 D20

Abi Group Limited slipforms barrier wall with their four-track Commander III on the M7 Motorway near Sydney, New South Wales, Australia.

HW-100602 D20

CEMEX slipforms a new roadway south of Cancun, Mexico, with their new GP-4000 with IDBI. A GSI® follows behind the paver measuring the smoothness of the new roadway.

HW-040708 D3

The joint venture team of CDS and Mukand are using a four-track GHP-2800 with IDBI to slipform the new National Highway 2 between the cities of Kanpur and Allahabad in Uttar Pradesh, India.

CV-050701 D2

Leis Maquinarias, GOMACO's distributor in Chile, promoted our equipment at the Expo Hormigon ICH show in May in Santiago, Chile.

CG-050715 D19

Kodama slipforms 3.5 meter (11.5 ft) wide pavement with their Commander III three-track on a project in Santiago, Chile.

CG-100617 D28

South East Concreting Pty. Ltd. slipforms half-width roadway with their four-track Commander III on a new roadway in Sydney, Australia.

CG-050731 D8

LBR takes advantage of their new GT-3400's right-side slipforming capabilities in Savenay, France. The machine's new G22 dual language capabilities allow the operator to operate the machine in his own French language.

CG-050704 D22

Imperial Paving Limited slipforms curb and gutter with their three-track Commander III on a parking lot project in New Westminster, British Columbia, Canada.

FT-020701 D4

Russian contractor Nur trims base with their 9500 trimmer on a new roadway project near Kazan, Russia.

COMACO around the world

CG-050730 D8

Eurovia's operator uses the GT-3400's remote control and operates the machine from ground level as they slipform curb and gutter on a project near Villedieu les Poeles, France.

HW-060701 D2

B.R. Goyal slipforms a new highway near Madhya Pradesh, India, with their two-track GP-2600 paver.

HW-020704 D20

Centrodorstroy is at work with their PS-2600 placer/spreader and four-track GHP-2800 paver on a project at the Domodedovo International Airport in Moscow, Russia.

Photos by Dennis Ernst SL-060722 D8

SL-060707 D12

SL-060728 D21

A New Race Track for "Thunder Valley"

A First Look at a Story in Development for GOMACO World Vol. 35, No. 3 –

A GOMACO SL-450 cylinder finisher is at work on a new race track for Bristol Motor Speedway, also known as "Thunder Valley," in Bristol, Tennessee. Baker Concrete Construction Inc., based out of Monroe, Ohio, is using their GOMACO SL-450 to pave the .533 mile (0.86 km) high-banked oval of the racetrack.

The project, and all of its exciting and challenging details, will be featured in the next edition of *GOMACO World* magazine!

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