REPORT

MIXING & INJECTION MACHINE
for Large-Scale Railway Projects

Location
India

Client
Rail Vikas Nigam Limited (RVNL)

Contractor
Larsen & Toubro Ltd
Dilip Buildcon Ltd
Rithwik Projects PVT Ltd
Navayuga Engineering Co. Ltd

Field of application
Soil nailing
Tunnel heading (pipe-umbrella)
Consolidation injections

Products used
FAIC 1100/2x725

Throughput
6 m^3/h

Delivery of plant
August 2021

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With a total population of around 1.4 billion people, India is the country with the second biggest population in the world, after China. The railways are the most important means of public transport in the country - there are more than eight billion passengers every year, and rising. Both the structures, the track network and the rolling stock of the state-owned Indian Railways (IR) are extremely old and prone to breakdowns. Failure and delays are an everyday occurrence. There is therefore an enormous need for investment. The Indian Ministry of Railways intends to invest the equivalent of 680 billion Euro in expanding the track network, including engineering structures, and modernising thousands of stations by 2030.

Rail Vikas Nigam Limited (RVNL), a wholly-owned subsidiary of the Indian Railways, is involved in the construction of the new, urgently needed rail infrastructure. The construction of new railway lines with a total length of 22,825 kilometres is planned by 2024; another 12,215 kilometres will be made double-track. And tunnels with a total length of more than 100 kilometres will be built.

Supplier for Large-Scale Project
Hänny AG, with its MIT (Mixing and Injection Technology) division and its Associate Trading Partner A&A International, Hyderabad, has been present on the Indian market for a considerable time. As early as the bidding and concept phase in August 2018, the CEO of A&A, Mr. Sudeep Thakore, made initial contacts with RVNL's project management and submitted a quote. As a result of the wide-ranging negotiations between the MIT project department and A&A on the one hand and the final client with his local consultants on the other hand, the offer was scrutinised and the FAIC machine for injection work offered by us was accepted after various adjustments.

Hänny AG has already supplied eleven automatic mixing and injection machines of the type FAIC 1100/2x725 for the RVNL project. The machines will be used on tunnel construction sites of the local construction firms Larsen and Toubro Limited, Dilip Buildcon Limited, Rithwik Projects PVT LTD, and Navayuga Engineering Co. Ltd.

The first machine was successfully commissioned in February 2021 by A&A International. Eight more machines are now in operation. The Indian representation of Hänny AG also assumes round-the-clock support for the entire project duration of approx. four years for all of the machines in operation with respect to maintenance, repair work, troubleshooting and spare parts supply, and guarantees interruption-free building progress as far as possible, with the presence of specialist staff on site.

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Special Construction for Building Site Transport
Each machine is made up of an HCM300 turbomixer to mix the cement-based suspension, two dosing pumps for adding liquid additives to the mixer and an HRW800 stirrer as a stacking container between the HCM300 batch mixer and the two double-acting ZMP725 injection pumps. At the same time, the SPS control for the complete machine also performs data registration of the mixing protocols and the pressure and quantity registration of the up to four injection lines.

The local Häny representative, A&A International, also supplied two Big Bag silos and all of the equipment that was installed on an HGV-compatible base frame together with the mixing machine. This self-developed structure makes transport of the equipment to the place of deployment in the tunnel bores much easier.

The mixing machine with the HCM300 mixer has a specified throughput of 6 m^3/h. The mixer is positioned on weighing cells. The whole mixing process is fully automatic, in line with the mixing recipe predefined in the mixer control. As soon as the mixing cycle has come to an end, the suspension is automatically transferred to the HRW800 stirrer (stacking container), provided that there is sufficient space in the stirrer to take the mixing batch.

Maximum Output 196 Litres per Minute
The two ZMP725 injection pumps are fitted with different plunger diameters: Pump 1 (ZMP725) has a plunger diameter of 120 mm and has a maximum pumping capacity of 196 l/min at a maximum pressure of 50 bar. The second pump (ZMP725) with a diameter of 85 mm can be operated with a maximum pressure of 100 bar and pumps up to 98 l/min.

Both pumps can be controlled in two different operating modes each. In other words, either one or two injection sites can be served per ZMP725 pump. Each of the two ZMP725 pumps can be operated both as a double-acting pump, this means with a pressure outlet, or as a double, individually single-acting pumps with two separate pressure outlets.

Up to Four Injection Sites
With the FAIC1100/2xZMP725 machine, therefore, two, three or four injection sites can be loaded individually and simultaneously, depending on the operating mode of the pumps. The pressure, quantity and volume of the up to four injection sites are registered individually at each injection line via a pressure sensor and inductive flow meter. A pre-set pressure can be maintained for each injection line via the control and individual stop criteria predefined for each of the up to four injection lines, including maximum pressure, volume or minimum flow. When such a predefined stop criterion is reached, the corresponding pump or injection line automatically switches off. The reason for stopping, pressure gradient, flow and volume are recorded in the control and can be read.

Our mixing and injection machines are needed for various injection work tasks in India. For example, the machines are used for soil nailing for slope stabilisation with a suspension with a w/c-value of 0.4, for tunnel heading using pipe-umbrella with a suspension with a w/c-value of = 0.5 - 0.6 and for consolidation injections with a suspension with a w/c-value of = 0.7 - 1.

Outlook
Due to the usually reliable MIT technology on the one hand and the completion of the machine including excellent on-site support on the other, the final client's requirements were met in full.

More machines are already at the final assembly stage and will be delivered soon.

Häny AG - Mixing and Injection Technology
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