ONE OF THE FIRST IN THE COUNTRY

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This article is devoted to the 50th anniversary of the continuous steel caster at the Perm Machine Plant (now the Kamastal Metallurgical Plant). The article describes the stages of development of continuous steel casting and its current state at the plant.

The metallurgical plant Kamastal is a subsidiary of the holding company Motovilikhinskie Zavody. The brand name “Motovilikha” has been on many different types of products made by the metallurgical and machine-building sectors for more than 270 years. The Kamastal’ facility supplies metal to the machine shops of metallurgical and machine plants, including those engaged in armaments production.

Having such a rich tradition and counting among its staff members such distinguished scientists as A. S. Tochinskii, V. I. Tyzhnov, S. S. Shteinberg, and N. N. Dobrokhotov, the metallurgists of Motovilikha have always been on the path of progress in metallurgical science and engineering.

Today, the Kamastal plant makes flat-rolled products and rolled sections, forgings, and stampings made of plain-carbon, medium-alloy, and high-alloy (including corrosion-resistant) steels for machine construction, the oil and gas industry, the building sector, the military, and other sectors of industry.

The steels are made in a DSP-60 electric-arc furnace operated with an independent treatment unit designed by FUCHS SYSTEM TECHNIK. The steel is cast into slabs and blooms on a continuous caster. Some of the steel is also cast into ingots in ingot molds. Steels that are of especially high quality are made on ESR units.

Flat-rolled products with a minimum thickness of 8 mm are made on a 2000 plate mill, while rolled sections (diam. 105–200 mm and 100 × 100 – 140 × 140 mm) are obtained on a 710 heavy-section mill.

The forging shop is equipped with 1500-ton-f, 2000-ton-f, and 3000-ton-f presses. The shop can make stepped shafts for heavy machinery construction, as well as shafts with conical surfaces.

The forgings made of plain-carbon and alloy steels have international certificates: DNV, Lloyd’s Register, and Category U.

Stampings of various configurations are made on 1–6-ton-f hammer presses and 450- and 750-ton-f hydraulic presses. The factory can produce small batches of metallurgical products for individual orders and products meeting special requirements.

The products of Kamastal are highly regarded in Russia and abroad and have repeatedly won international recognition (the “Gold Star” and “Gold Globe” awards, the Certificate of the Research Center of the European Market, etc.) for their high quality and competitiveness.

The continuous caster at the Perm Machine Plant was one of the first continuous-casting machines built in Russia, having begun operation in June of 1958. The decision to have the caster made at Motovilikha was a stroke of engineering genius that can be credited to two people: V. N. Lebedev, Director of the Motovilikha Plant and a Hero of Socialist Labor; and L. F. Grigor’ev, the Deputy Director for Metallurgical Operations.
At the time of introduction of the caster, steelmaking shop No. 21 had six open-hearth (OH) furnaces. Each furnace had a capacity of 70 tons. The metal was cast in ingot molds to obtain ingots for forging and rolling sections and slabs.

Construction of the continuous caster, begun in 1956, made it necessary to eliminate the disproportion that had developed at the plant: casting steel in ingot molds was no longer productive enough to keep up with the rising volume of steelmaking. In addition, continuous casting would increase usable output by 15–20%.

The continuous caster was built with the participation of every department at the plant. Execution of this project required the creative contributions of hundreds of production workers, engineers, and technicians. Everything about the undertaking was unique: the need to build a high tower at the site of a marsh, the fact that the steel-pouring ladles were designed on the basis of laboratory models, and the fact that the casting technology itself was very innovative.

In a record time of two years, the plant erected a then-unique 43-m-high tower for the caster proper, constructed a pumping station and oxygen plant, built a water-cooling tower, and installed complex mechanical and power-generation equipment weighing a total of more than 1200 tons.

The casting complex initially consisted of two dual-strand vertical slab-type casters for obtaining 220 × 1000 mm slabs by a method that involved the periodic addition of molten metal to the main flow, with the flow from one mold being intercepted by the flow from the other mold. The first six months of operation of the unit showed that this approach was unproductive, and in 1960–1961 the casters were rebuilt to cast 175 × 1020 mm slabs by a method that involved sliding of the ingot skin. Each strand became an independent casting machine, and one of them was later rebuilt into an experimental unit for casting 280 × 280 mm blooms in two strands.

The new process was introduced with the aid of the best furnace personnel, ladle operators, and casters: P. G. Orekhov, V. A. Gomzyakov, A. Ya. Khovanskii, M. S. Imaikin, V. E. Shilintsev, V. A. Fomichev, M. G. Plotnikov, V. A. Merzlyakov, V. I. Charushnikov, and others. Among the contributors from the machine shops were electricians, mechanics, gas-cutters, and welders: V. F. Bazhutin, P. I. Murzhin, P. S. Luzin, A. A. Gilev, I. K. Myrzin, E. A. Dubovtsev, N. N. Bryukhanov, V. N. Chumakov, I. G. Fadeev, and others. V. E. Girskii, the supervisor of the new section, came from the Izhevsk plant as a young but experienced engineering and inventor.

Mastery of the new equipment and technology proceeded with difficulty and was fraught with problems. There was no prior experience on which to draw, and there had not even yet been any theoretical research into the continuous casting of semifinished products with a large cross section. Both theory and practice were being born at the plant.

Nearly every casting operation was accompanied by some emergency situation. The low quality of the refractories, the instability of the OH steel’s temperature, and its high content of harmful impurities (sulfur and phosphorus) necessitated the unplanned discharge of the melt into emergency vessels on a daily basis, led to breakouts in the secondary cooling zone of the caster, caused failures of the equipment, and were responsible for the formation of a large number of internal and exter-