ADVANTAGES OF NEAR NET SHAPE BEAM BLANK CASTING TECHNOLOGY

Beam blank casting is the ideal link between the steelmaking plant and the rolling mill. This method produces high-quality structural beams with a wide range of product dimensions. Beam blank casting results in fewer passes in the section mill, lower manipulation costs and reduced energy expenses. The commercial benefits of beam blank casting include cost savings due to reheating, reduction of deformation energy and a reduced number of passes in the rolling mill.

Near-net-shape casting is a family of techniques where the initial production of the part has a quality surface finish and is close to the final (net) shape. Reducing the need for traditional finishing techniques, such as machining and grinding, can eliminate more than two-thirds of the production cost in some industries. Net-shape casting techniques include investment casting, spray forming (deposition), polymer blow molding, vacuum forming, compressed air forming, laser forming, rapid prototyping and nanotechnology manufacture.

Continuous casting and rolling of beam blank has become a common practice in the steel beam production. Development in recent years concentrates in casting near net shape beam blanks. The difference between the conventional and near net shape beam blank. Conventional beam blank has a relatively thicker flange, usually over 100 mm, while the near net shape beam blank has a flange thickness less than 100 mm, usually with a lower limit 50 mm in the practice. Dozens, even a hundred beams can be produced through rolling only one beam blank.

Near net shape beam production is also one of the recent interests of beams producers around the world to reduce costs induced by reheating and rolling of beam blanks. This is done by combining the casting of near net shape beam blanks (web thickness of 50 mm) and direct rolling. The grade of the near net shape is determined by the required minimum rolling passes to obtain the desired metallurgical microstructure. The plant based on the near net shape beam blank concept is very compact. It primarily consists of beam plant casters to provide beam blank, a furnace to reach required temperature distribution for rolling, a conventional break-down stand, and a U1-E1-U2 universal stand group including an universal roughing stand, a 2-high edging stand and an universal finishing stand.
The output of the rolling mill is increased of about 1 %, due to improved shape formation as a consequence of the near net shape beam blank, particularly at the beginning of the rolled beam. There is an additional potential for reheating energy cost savings of about 8 % caused by the better surface/volume ratio for beam blanks in case of cold charging.

The economic advantages due to near net shape of beam blank casting for the production of beams and sections can be mainly attributed to the reduced (or eliminated) rolling costs at the roughing stand of the hot rolling mill. These are summarized below.

- Around 30 % lower investment costs
- Around 15 % increased productivity
- Elimination of rolling passes at the roughing stand
- Around 1.5 % higher yield
- Lower operating costs
- Lower energy consumption and lower CO2 and NOx emissions.
- Around 55 % lower maintenance costs
- Reduced man hours needed per ton of steel
- Intermediate storage of blooms not needed

The above benefits have contributed substantially to the rapid increase of beam blank casting in recent years. The economic advantages of beam-blank casting for the production of beams and sections can be mainly attributed to the reduced (or eliminated) rolling costs at the roughing stand of the hot-rolling mill.