"Bulk handling equipment is one of the most neglected areas by plant designers."

Jai Gupta
Chief General Manager, Holtec Consulting

The Indian industry has grown rapidly in past two decades. The overall production capacity too, has quadrupled in the last 20 years. This rapid growth has posed several challenges to the industry. As production units expand to leverage the economy of scale, demand for bigger and faster bulk material handling equipment too, is growing. **Jai Gupta, Chief General Manager, Holtec Consulting**, shares his views with ICR about the new technologies evolved to meet this growing demand. Excerpts from the interview.

What are the new challenges in bulk material handling (BMH)?

The conventional, easy to access locations are no more available. New projects are forced to go to far-off places, away from markets, or are being forced to manage in a limited area. Growing demand for fly ash- based PPC production has pushed several industry players to set up grinding units close to thermal plants for fly ash consumption. As these thermal power plants are generally located close to densely populated areas, space is always a constraint and hence they cannot develop good infrastructure for rail/road movement of material. It is crucial to substantially reduce time and space requirement for loading and unloading the railway rakes.

Which new technologies at BMH can be applied in the cement industry?

Keeping in view of conserving scare resources, several new concepts have emerged in material handling. These include in- motion rapid loading of material in railway rakes, movable wagon loader feeding stationary rake, use of bottom discharge wagon for transport and unloading, and the use of wagon shifters to substantially reduce the area required for the installation of a wagon tippler.

What is in rapid loading? How does it work?

Conventionally, loading of material in rakes is either done via overland hoppers constructed on top of the railway tracks or manually through pay loaders. The usual time taken is 3-6 hours depending on the equipment employed. In rapid loading, it takes only about 60 – 80 minutes to load the entire rake, from a single discharge point, and it is done while the rake is in motion.

In rapid loading, a silo with one full rake capacity is constructed over the rail tack. The rail moves below the silo. Below the hopper of the silo, another small hopper with a capacity to hold one wagonload of material is provided. This second hopper is mounted on load cells. The two hoppers are connected through hydraulic gates in such a way that the material gets transferred from main hopper to the weighing hopper within seconds.

The silo is filled with material before the train arrives. First, the load cell hopper is filled with material of desired weight. The loading starts as soon as the wagon comes in position below the hopper. The material is transferred in the wagon before it crosses the loading point. The train is in continuous motion rolling at a speed of about 0.6 to 0.7 km / hr. No time is wasted in starting and stopping the train. The hopper gets ready to load the next wagon much before the next wagon arrives at the loading position. A full railway rake of about 650m length is loaded in about one hour. Holtec has designed such

a system with some modifications for lignite loading. Assuming average savings of three hours per rake, we may save about 2,000 rake hours for handling about 2 mio tpa capacity. This helps in better utilisation of rakes. The total investment in such systems is much less than conventional systems; it requires a lesser number of operators and is also free of dust nuisance and material wastage. Requirement of civil work is also less.

What are the requirements for building such a loading facility?

For hauling the railway rake at constant speed of 0.6 to 0.7 km/hr, creep drives must be installed on the locomotive. As normal locomotives with Indian Railways do not have it, plants will have to maintain their own locomotive with such drive for haulage of railway rakes.

How can one reduce space required for material loaders?

Some of our clients had space constraints so we have provided them with a moving wagon loader. In this system the wagon / rake is stationary while the loader moves along the rake with consistent speed from one end to the other. The loader loads the material while in motion. The wagon loader is provided with a diversion chute at the outlet, which is designed in such a way that it diverts the flow to next wagon at the junction point. After a certain amount of travel, it returns to the initial discharge point.

The loader is positioned with two tracks on its either side so that it can load more rakes faster. It is fed by a stacking conveyor and has a reversible boom conveyor for feeding the wagons on both the tracks. It has a capacity of loading 1500 – 2000 tph without any difficulty. And if the material is fed gradually, we get a smooth filling of the wagon. The smoother the filling, the less the dust nuisance. The main benefit of this system is that the land requirement is very less. A rapid wagon loader requires a track length capable of accommodating at least two rakes. However, this system works in one rake space. One can line up two rakes side by side and hasten the process further. Besides this, the plant need not have a locomotive engine for hauling the rakes.

Wagon tipplers require a considerable amount of space.

Tell us about space saving developments in wagon unloading.

We all know that land for the industry is gradually becoming scarce resource. Unfortunately, wagon tipplers require a considerable size of real estate. In some cases, we have noticed that entire production unit fits in about five hectares of land, whereas rail installation for smooth functioning of the wagon tippler takes-up about 7.5 hectares of land, that too in a typical plot size of 50 m width X 1500 m length. In our recent projects we have faced several problems on this account. To tackle such issues, wagon traversers are being installed in one of Holtec's projects.

The wagon shifter works at the same speed as the wagon tippler and both pieces of equipment works in tandem. In this way, the land requirement is reduced to almost half. Only one parallel track needs to be constructed aside the track for removal of wagons.

Where do we fall short while installing BMH systems?

Bulk handling equipment is one of the most neglected areas of plant design. Most plant engineers focus on the core equipment and processes. Bulk handling is often seen as an accessory function. One should also envisage the possible impact on the system if such a bulk material handling equipment fails; a contingency plan must be in place. Very few realise the amount of mechanical tension the conveyor belt is in. I know a case where the belt snapped and damaged the support framework structure. BMH is a complicated science and expert opinion must be considered at the design and set-up stage. ICR