The plant remained operational during installation

Fully charged

Han-Tek Inc. supplied a custom built charging crane to fellow US firm Special Metals Corporation for its high performance nickel and cobalt alloys plant in Dunkirk, New York

While New York has been losing manufacturing jobs for a number of years, Special Metals, owned by PCC, has actually increased the size of its Dunkirk facility. The main goals of this expansion were to increase production and throughput and shorten order turnaround time. Han-Tek (www.han-tek.com), a materials handling integrator which specializes in overhead cranes, systems automation and electrical controls, based in Victor, New York, utilized several aspects of its core business to provide Special Metals with a state of the art charging crane.

The project was originally targeted for 52 weeks, but with the client under both internal and external pressures to ship product, the schedule had to be substantially accelerated. As with any expedited project, the team encountered a number of issues. However, tight project management on both sides, weekly conference calls involving all parties and an open transfer of information kept everyone up to date and helped to avoid serious problems.

In order for Special Metals to meet existing product commitments, the plant remained operational during installation. The original crane and press were under production while the

new charger was installed on the extended portion of the runways, while the DC hotrails were split to prevent the old crane from entering the expansion zone. The crane was shipped to site on five trucks with over-height, width, length loads, which was a production task in itself. Han-Tek had an average of eight people on site and double shifts were run whenever possible. This was necessary for two reasons; first, to accommodate the newly abbreviated schedule and, second, to receive and begin installing components of the staggered shipments. Once again, the team of client, supplier and vendors came through and the entire installation from

The new crane is used for servicing multiple furnaces on both sides of the bay

rigging to commissioning took under two weeks.

Dedicated machine

The new crane is a dedicated machine used for servicing multiple furnaces on both sides of the bay, as well as a forging press. Loads are picked from the furnaces and from floor rails and placed on the press infeed conveyor. The charger handles similar types of loads on a repetitive basis. Loads are mainly ingots of nickel or cobalt alloy of varying sizes. What each load has in common is the importance of the time between removal from the furnace and delivery to the press. In order for product to be cured and forged correctly this move must meet timing criteria determined well before the project was awarded.

The nature of the product and process was such that the location in the furnaces is not exact. In fact, there are typically multiple ingots in each furnace at one time. The operators nudge the ingots around inside the furnaces so that they are in convenient locations and accessible by the crane's clamping mechanism.

The crane is CMAA Class F, 65ft span, 12 ton capacity. This is deceiving though because the 12 ton capacity is at a distance of 20ft from the center of rotation.

Other than the obviously custom and dedicated nature of this machine, the critical parts are the acceleration and the control systems.

Acceleration

As stated, the ingots must be transferred within a specified time limit. To do this, the 300,000lb crane must ramp up to speed and, once in position, decelerate to place the ingot. A detailed time study of existing and new equipment and the new process led to upsizing the bridge drives to twin cross-shafts at 75hp each, for (4) wheels driven. Similar analysis was done for the trolley, rotate and “peel” (up/down) motions.

The crane is CMAA Class F, 65ft span, 12 ton capacity

Controls

Motor control: The motors are all AC 460 volt, with variable frequency drives (VFDs). These VFDs are over-sized to be able to achieve the acceleration rates and keep up with the 24/7 class F service.

Operator control: The operator's seat has two joysticks, the left controls the rotate, peel and the grab (with a toggle pushbutton on top), the right controls the bridge and trolley. Based on the continuously rotating cab on trolley nature of this crane, the complex layout of the bay and the existence of another crane on the runways, the crane has "point and shoot" control, as opposed to the standard compass based control. Whatever direction the operator points the bridge and trolley joystick, the cab will travel. This is a more intuitive type of control and was necessary to give the operator the highest degree of safety possible.

Collision avoidance: The overall controls system contains two PLC's, three lasers and wireless communications on the new crane, as well as a PLC and wireless communications with the existing DC crane. The system tracks the position of the bridge, trolley and rotate on the new crane at all times, as well as the position of the older DC crane. These controls must take into account the proximity of the runways, the end wall, high points in the production bay and the DC crane on the

Patrick J. Tobin

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In this application fork trucks would not have been a viable solution because they would expose the operator to a severe heat blast from the charging oven. In addition, the delivery speed is a major concern at SMC and a fork truck would not be possible.

In some of the new applications that we have been investigating there is also a concern about the delivery speed as well as the pick and delivery accuracy (the tolerance is only a of tenth of an inch).

This would eliminate any possibility of a 'manned' solution. Any viable solution would have to be at least partially automated.

Again, in the newer applications we have competed with transfer cars and ground-based gantry mounted robots. Neither of these solutions provide the flexibility that the overhead crane provides.

First, they are both set on tracks so they would always have to operate at least within the confines of the established track. Most of the application we have seen would like to keep their systems as flexible as possible to accommodate potential future expansion/added furnaces or new configurations. Second, with the transfer car you would also be very limited on your ability to adjust heights. The robot can handle some height changes, but, we believe it is also a much more expensive solution. The weights are outside of the limits of most robots and thus a very customized robot would have to be designed specifically for this application.

Han-Tek is an integrator for Fanuc Robotics USA and we did extensive research on a robotic solutions before determining that it was not the way to go. At special metals, with a 12 ton ingot, it certainly would not have been an option.

What each load has in common is the importance of the time between removal from the furnace and delivery to the press

runway to prevent any part of the crane from colliding with any possible obstructions.

Its main function is to protect the operator and surrounding equipment from collisions using programmed zone-outs. It also provides the future ability for automated moves, which can increase productivity even further.

Han-Tek is researching a project that would begin automating some of the crane moves with the operator still aboard. In addition, a continuously updating on-board touch screen will show the operator the exact status graphically of not only his crane (including position and faults) but also the neighbor DC crane on the same runways. Taking it one step further, the crane was designed so that should Special Metals ever decide to operate it by remote control, such an upgrade is possible.

The new charging crane was to be benchmarked against the existing unit that operates on the opposite end of the bay. However, to save cost the new charger would take advantage of an AC power source as opposed to the DC powered original. Not only is the new crane quicker, its state of the art features render it a safer and more maintenance friendly machine. AC was chosen because it is a cheaper power source and because components and spares are less expensive and much more readily available.

In fact, with the slowly expiring DC market there are some altogether obsolete DC components. The main concern with AC in a time critical production environment is speed; the need to move the product from A to B quickly. When put to the difficult task of keeping up with the DC predecessor, the new crane came through with flying colors. Through time studies and measurement of the actual speeds and acceleration rates of the existing DC crane, Han-Tek was able to beat the acceleration rates of the DC equipment and beat the transfer times required by the client.

In the end the project was a win-win for everyone involved; Special Metals and Han-Tek. The success of the new charger crane has created future opportunities to attack applications that require such a high level of precision, speed and safety. As Han-Tek manager of business development, Patrick Tobin, put it: "These are the types of applications that you really enjoy being a part of. To be able to assist with a project that brings jobs, efficiency, safety and a new revenue center to the area you work in everyday, is a truly rewarding experience." OCH