

Keys to Success When Launching a Transfer Job

As the countdown to a new transfer project commences, follow the guidelines outlined here to ensure a successful launch, meeting or exceeding goals for throughput and quality.

BY PAUL STIRRETT

After many years of being involved in numerous transfer projects, we thought it was time to develop a list of all of the key factors we believe are instrumental in launching a successful transfer project, as well as a list of all of the major pitfalls to avoid during project management. With the recent evolution of servo-transfer systems, stampers and die makers have a host of new opportunities to improve productivity and quality. Transfer-system suppliers using customized servo-sizing software and developing machines with robust and reliable mechanical systems and with few (if any) wear components should result in a press line that runs at rated speed or above, shift after shift.

The Right Equipment Combination

A new transfer-automation project begins with careful and proper selection of the right press and style of transfer system. Errors made at this stage can prove very costly. Issues to focus on include understanding the impact of link motion to the transfer automation timing and motion profiles, maximizing the range of motion on the transfer

Paul Stirrett is vice president of sales, Linear Transfer Automation, Barrie, Ontario, Canada; 705/735-0000, www.lineartransfer.com.



The front- and rear-mounted transfer system shown here is mounted on a 1500-ton mechanical press, with 256 by 96-in. bed, at Metrican Stamping, Dickson, TN.

automation, accounting for interferences with other equipment around the press, quick-die-change procedures, and selecting the right style of transfer for the application(s).

Here are some of the differences between the two styles of transfer systems.

Window-mount—Advantages

- Occupies minimal space around the press, as the equipment mostly is positioned inside the press columns;

- An efficient design allows the system to move less of its own mass than does a front- and rear-mount transfer;

- It has bars running only through the die area, which remains wide open and optimizes accessibility when it comes time to perform die maintenance and adjust the transfer fingers.

Window-mount—Disadvantages

- The small press window restricts



A common method for mounting end-of-arm tooling is use of a common plate located on the bars—which includes several fixed finger stations—shown here mounted on the inside face of the transfer rail of a front- and rear-mounted transfer system.

part width;

- Less flexibility with respect to the independent motion of the front-to-back rails;
- Often, the press window must be enlarged, which can add cost to a new press;
- Often not well suited to the retrofit market;
- Can be difficult to adapt for takeover transfer work, possibly requiring significant modifications to the tooling and transfer fingers.

Front- and Rear-mount—Advantages

- Mounts on any style of press, including presses lacking windows;
- Fully independent head control—front rail can run a completely different motion profile to the rear rails;
- Typically has a larger range of motion than a window-mount system, with infinite passline adjustment and no restrictions due to window size;
- Can be easily adapted to accept emergency or takeover work, using bars and fingers from other transfer systems;
- Deflection rates tend to be less than with a window system, because the transfer rails are held at points in the center;
- Robust design capabilities allow heavy payloads to run at maximum rates.

Front- and Rear-mount—Disadvantages

- Takes up more room on the front and rear of a press, which can be a dis-

advantage with rolling bolsters and during die changes performed with an overhead crane. Longer tracks are needed to ensure that the bolsters extend past the transfer's footprint.

Teamwork, from Start to Finish

All successful projects start with a room full of the key players selected for the project being on the same page. The metalformer should ask the question, "What can go wrong," of the press supplier, transfer source, die shop and the feed-equipment vendor, as well as

his own key personnel. This process sets a tone from the start that finger pointing, once the project gets underway, will not be tolerated. This is the time to identify early-on any potential problems that might occur, and to account for them. From this meeting should come a set of master task lists and schedules, to be shared with the team and updated throughout the project.

No vendor can work in isolation from the others. High among the concerns of the companies developing the transfer system and tooling are the motion profiles, tooling interference curves, and motion strokes for optimum tool design and transfer performance. Working together, the vendors must avoid any interference from pins, cam drivers, heel blocks, etc. with the finger tooling during the stamping process.

Other key issues to address include transfer-finger designs and clearances for the end-of-arm tooling in the dies. Perform a transfer-interference analysis and run-at-rate analysis to identify, address and rectify any potential issues during the tool-design phase. Waiting until later in the project to perform these studies can prove very costly. The use of internet-based meetings and



A servo-transfer system mounted on this 250-ton gap-frame press automates stamping of deep-drawn components.

online design-review tools allows these meetings to occur cost effectively and successfully. This is particularly true for programs where dies are being built offshore.

First-Hand Experience

Says Murray Brooks, president of tooling supplier J.P. Bowman Tool & Die Ltd., in Brantford, Ontario: "Our experience allows us to candidly tell the customer (stamper) that we would like the option of quoting tooling to run in a transfer system. It opens the door to many more opportunities to produce complex stampings compared to running them in progressive dies. We look for opportunities to implement nesting of blanks to optimize material usage; part rotation within the process to allow parts to be contacted in the ram direction, if required, to minimize costly cam requirements; and increase pitch between parts to allow the use of cams for dimensional control. All of these contribute toward reducing piece-part costs with improved quality and repeatability, opportunities that would not otherwise be possible in a progressive-die process.

"Prior to designing and engineering a production transfer-stamping die," Brooks continues, "the primary requirement is for our customer to provide accurate and current CAD information for the transfer system and the stamping press—press stroke, ram speed and specifications related to the integration of the transfer system to the press. In some cases, with a short press stroke there is insufficient daylight between the upper and lower die assemblies to transfer the part at a desired production rate. This may mean that in order to run a particularly deep part at an acceptable production rate, a press with a longer stroke might be preferred. This allows the equipment to engage the transfer of the part from station to station on the up stroke and drop it off on the down stroke, optimizing the strokes per minute and resulting in a smooth transfer motion.

"All of these parameters," Brooks surmises, "allow an experienced tooling

source to develop a stamping process that will not only produce the stamped part with optimum quality, but also to successfully transfer the part in the customer's production equipment with a maximum run rate."

The Key to Speed

Optimizing transfer-press productivity requires specification of the right transfer-system parameters, ensuring that the system has the optimum horsepower in its actuators to run the heaviest parts with the largest motion profiles. The stamper must consider not only its current programs but also any future parts that the press might be required to produce, including potential takeover work.

Drive-train selection software—developed over many years using data from previously developed actuators—is a valuable tool used during this process. Due to the specific nature of transfers, customized application software often is used for specifying drive-train parameters. The stamper must provide the transfer source with accurate information regarding payload weights, which must include any other equipment—receivers, accumulators and other ancillary equipment that will add substantial weight to the transfer bars. The transfer source uses this information, combined with the maximum part weights, to size and select the proper motors, gear heads, pulleys, belts and other components that will comprise the drive train.

Proprietary transfer-system design software allows a vendor to address key issues such as transfer-bar deflection and motion profiles, based on the use of link-motion presses or eccentric. For example, if most of the stamped parts have a very aggressive grip stroke, the stamper can achieve higher run rates with a different bar profile.

Do not underestimate the expected run rates by basing specifications on previous experiences running similar parts on older mechanical transfers. Today's servo transfers have much smoother motion and minimal bar deflection, and can therefore achieve

very high run rates not considered possible in the past. Any speed concerns should only center on the capabilities of the press or the die.

Let Your Fingers Do the Walking, But Don't Lose Those Parts

When it comes to designing and developing end-of-arm finger tooling, failure to appreciate the importance of this task and the attention to detail required can cause a stamper to pay the price in run rate, equipment downtime and startup time. Some stampings can easily be transferred at high rates using simple and inexpensive shovel-style tooling. Other parts require the use of pneumatic grippers or magnets to stabilize the part when transferring at high rates. Automation such as servo rotation, part ejection, lateral rotation and linear motion can be added to the transfer rails to manipulate the part, which helps the die designer simplify die design and achieve higher run rates. Tooling with quick-release mechanisms will expedite die changes.

Common methods for mounting end-of-arm tooling:

- Fixed tooling—the bars and fingers are changed out and stored on a rack near the press or with the die.
- Receivers placed in incremental locations on the bars where the end effectors are inserted. This setup is most common on large transfer presses with rolling bolsters and two sets of bars, and offers advantages when running a large number of parts and where minimum die-change times are required.
- A common plate located on the bars that includes several fixed finger stations. These plates typically store on racks located near the press.

Each of these mounting setups has advantages and disadvantages related to cost, flexibility, die-change simplicity and efficiency. Factors that affect the selection include the number of parts being run; bolster size—on some small presses, the bars and fingers can be easily handled manually; part complexity; the footprint of the press cell; storage capacity; and any jobs that might come down the pike in the future. **MF**