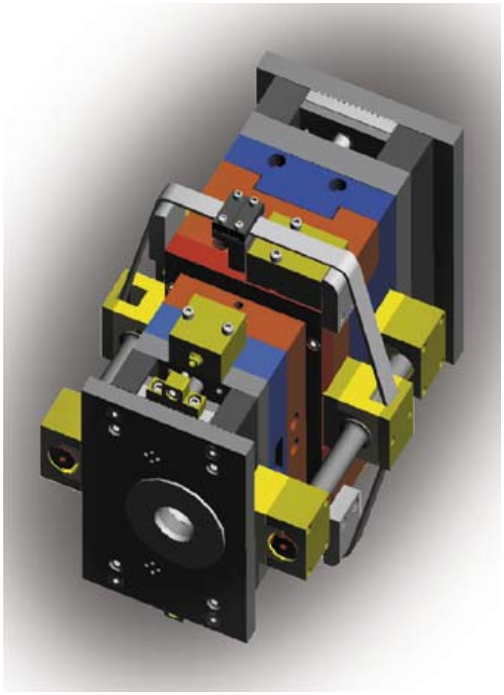
Fachhochschule Bielefeld
University of Applied Sciences

TandemMould Conversions

Increasing Production With Your Traditional Moulds



With TandemMould you can considerably increase the economical efficiency of injection moulding production (N.N. 2003). This is the case in the most varied of application possibilities, not only on slow processes but also on very fast cycles. On technical moulded parts TandemMould makes it possible with two alternating parting levels to double the part output, because during the cooling time at one level the second level can already be de-moulded and refilled (Fig. 1). Compared to stack moulds where both parting levels work synchronously, TandemMoulds offer the following advantages:

- the shot volume is only required for one parting level
- the mould opening stroke is at max. the stroke required for de-moulding one parting level.

This means standard machines can be employed, whereas stack moulds require special machines. On TandemMoulds, the injection unit does not require double shot volume or double injection performance, and the travel side does not require double the opening stroke.

A further advantage is, that with the corresponding Tandem machine control

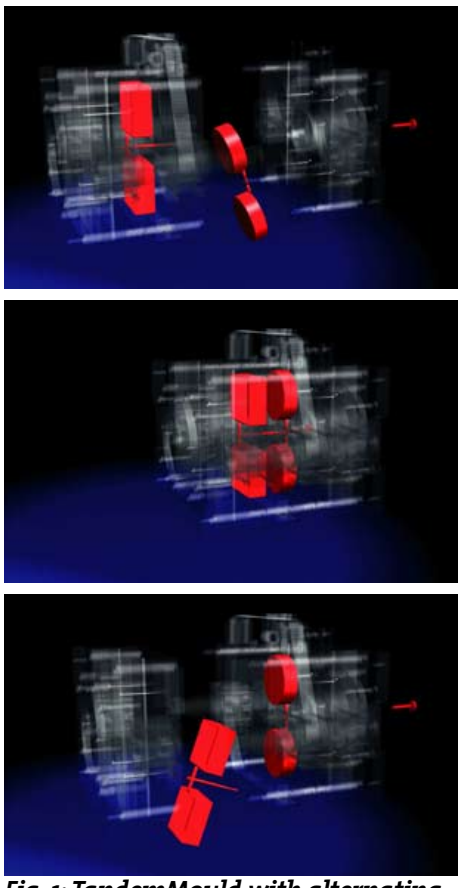


Fig. 1: TandemMould with alternating running cycle

programm, parting levels containing different form part shapes can be employed, whereby each parting level can be optimised completely independently. This feature gives TandemMould a new significance in the production of component assemblies in Tandem family moulds.

Fig. 2 shows examples of component assemblies. Generally, a fitted pair of parts is the basic requirement, the more different the parts, the bigger the problems are producing such parts in just one mould with applicable cavity inserts. This is the reason why, as a rule, two separate moulds are employed, each running in their own injection moulding machine. Employing TandemMoulds with independent parting levels, means the same level of production can be achieved on one single injection moulding machine. Cost savings increase proportionally with larger sized machines, e.g. door panels in the automobile industry.

Fig 2: Examples of component assemblies for a TandemMould-family

In cooperation with the Bielefeld University of Applied Sciences, a young team of analysts has carried out research into which existing moulds can actually be converted into a TandemMould and into the conversion extent involved (see also: www.TandemUmbau.de). The advantages are apparent. At present, two moulds require two machines, but after conversion only the one larger machine would be required. As amortization studies show, the mould conversion has paid off after one year at the latest.

Pre-conversion checklist:

Apart from the question of conversion costs, there are two further questions which must be asked concerning the utilization of the existing machine:

- What will the overall mould dimension be
- Which mould will be the injection side.

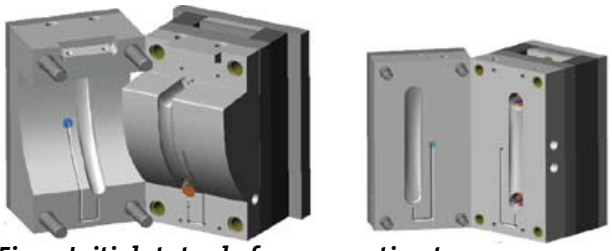


Fig. 3: Initial status before converting two existing moulds

Using two mould tools for producing handles as an example, the procedure will be explained below. Both moulds are GIT tools, each running with a cycle time of 80 secs. (Fig. 3)

Overall mould dimensions

Presuming that the larger mould had already run on an existing machine, only the height of the second mould has to be added. This overall mould build height plus the larger of the two opening strokes (Fig. 4), must be smaller than the maximum opening on the injection machine.

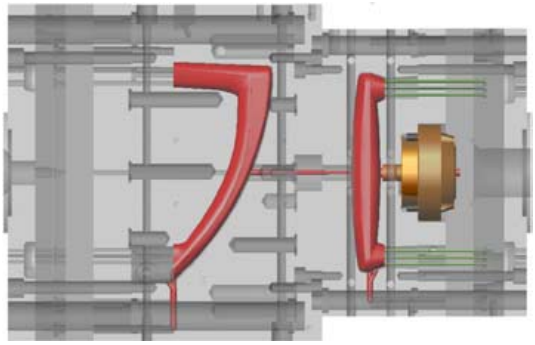


Fig. 4: Overall height of the converted TandemMould

Analysis of a selection of other moulds show, that even moulds with 100 mm oversize can be converted successfully into TandemMould. Firstly, two clamping plates can be omitted and secondly, on most machines the maximum opening stroke can be increased by shortening the pressure bar situated between the travel platen and ejector plate. This conversion, can in consequence, require the fitting of a side mounted ejector drive e.g. hydraulic cylinder. The mould clamped to the injection side platen must also be fitted with a side mounted activator for the ejector plate.

Which mould will be the injection side?

Basically, TandemMoulds are built similarly to stack moulds, i.e. the ejector side of both parting levels is opposed outwards. This means that for part gating the melt can be injected either directly above the centre plate with an offset injection unit situated behind the inject-moulding machine, or the melt can be transferred by an appropriate hot runner system to the usual central gating position. The first alternative is simpler for the mouldmaker, but requires a special machine. The second option normally requires a special hot runner, but can be applied on all standard injection mould machines.

Normally, on stack moulds melt is injected through one ejection side. This also applies to those TandemMoulds at present running in production. Therefore, before converting existing standard moulds, one must determine which ejection side would be easier to accept a hot nozzle assembly (Fig. 4).

Specifically, this means that the ejection side of the mould with the lesser height, i.e. offering sufficient space for the injection side hot runner, will become the injection side of the converted TandemMould.

The Conversion:

Once the basic points as mentioned above have been clarified, the actual conversion is unproblematic. First of all, surplus clamping plates are removed. Both moulds are assembled on to a new adapter plate. This plate fits both mould-halves, including the guide and bush pitch and where applicable, coolant fittings for relevant runs. (Fig. 5)

The injection side mould-half in this example is equipped with an air ejection jet (Hasco). This element has been integrated into the ejection side of the flatter handle mould. Injection into the furthermost parting level containing the taller-shaped handle is by cold runner. This part gating corresponds to the original mould runners. Only the sprue bush has to be replaced on this mould.

For smooth mould running, the injection side parting level of the flat handle employs a double umbrella gate. With

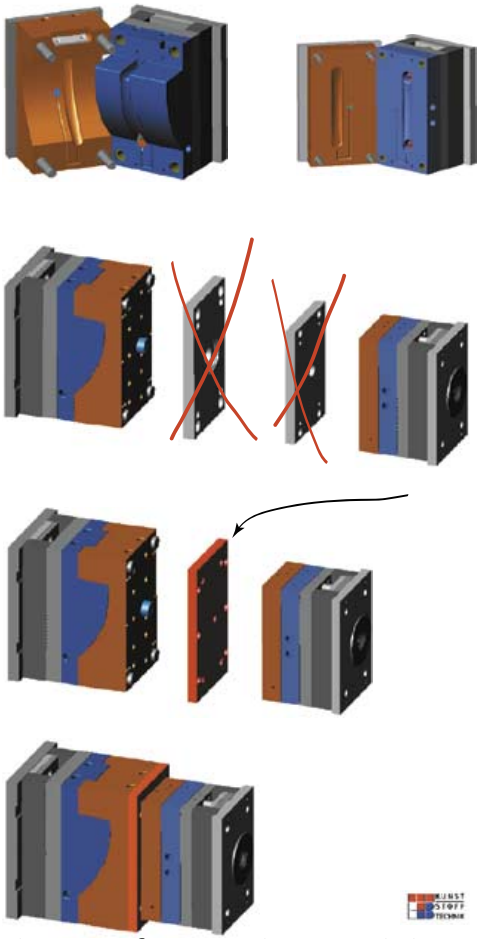


Fig 5: Steps for converting two existing "traditional moulds" into one TandemMould

each cycle the injection side sprue is blown out towards the machine injection nozzle by means of a pneumatic jet. On opening the furthermost parting level for ejecting the tall-shaped handle, the tapered point sprue rips away at the umbrella. (Fig. 6) As long as the thickness of the umbrella is less than that of the sprue at that point, this will always reliably tear a hole in the umbrella through which the furthermost level can be filled through the nearer sealed level during the next cycle.

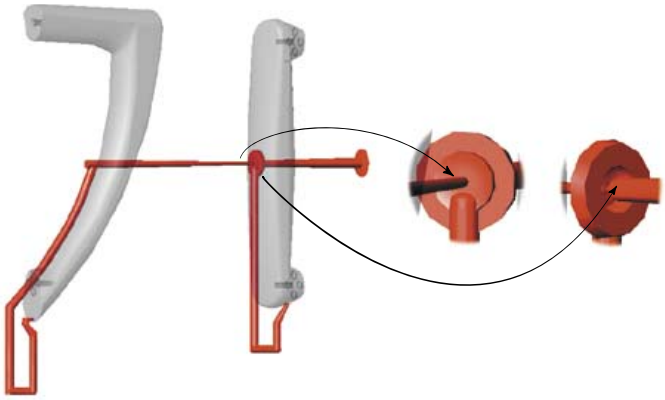


Fig. 6: Melt flow path by cold runner and double umbrella gate in the nearest parting levele

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Final Comments:

Basically, all these points which have been discussed also apply to building a new TandemMould. Especially when building large moulds, it is more practical to design the TandemMould as two separate single moulds. One reason for this is, that any design change for one mould-half can be implemented independently of the other mould-half.

Similarly, for the mouldroom this applies to those new products where the market potential has not as yet been clearly determined. If, initially, a TandemMould is to be considered, only the ejection mould-half need actually be built. As market demand eventually increases for this particular part, the second mould-half of the TandemMould can then be built and easily adapted to the mould already running in production.

We would like to express our sincere thanks to TB Kunststofftechnik/ Lage without whose immense support this project would not have been possible.

Literature:

N.N., , Leistungssteigerung mit Tandemwerkzeugen. Der Stahlformenbauer 1/2003, S. 4 ff.

N.N. Internetseite: www.TandemUmbau.de

Bodeving, C. et al., Tandemmaschine verbessert Wirtschaftlichkeit beim Spritzgießen, Kunststoffe 84, 10/1994, S. 1375 ff.

Jaroschek, C. Schmelzeführung in Tandemwerkzeugen, Kunststoffberater 5/2003, S. 30 ff.

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Jaroschek, C., Scharein, D., Bluhme, H.-K., Giesbrecht, E., Peters, P.

C. Jaroschek, Bielefeld 15. Juni. 2003