FIXED DUMMY BLOCKS

CASTOOL TOOLING SYSTEMS

The dummy block is a critical element for extrusion quality and press performance. A dummy block is in direct contact with the billet. Its' successful operation depends on a number of factors. For example, press alignment (both thermal and physical), proper pre-determined expansion size and expansion rate, lubrication, maintenance and so on.

The most important factor in the effective operation of any dummy block is its' efficient interaction with a round, straight, thermally, and therefore dimensionally, stable container. The lifetime of the dummy block is strongly dependent on the right combination of expansion angle, hoop strength of ring expansion and yield strength of the block holder.

PURPOSE

- **Allow gases to escape during the combined process of billet upset, and burp decompression, reducing blisters**
- **Maintain a minimal uniform skin of aluminum on the liner inner diameter reducing profile inclusions**

FUNCTION

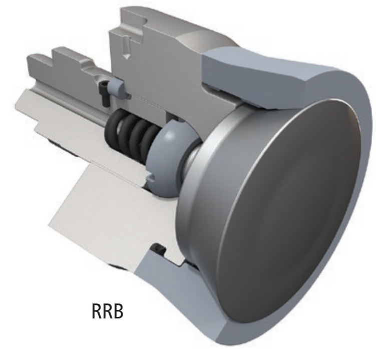
The function of the dummy block is the extension of the ram or stem, which pushes the softened alloy through the die. There are a number of functions that must be satisfied by an effective dummy block.

- To repeatedly transmit the force of the ram, at high temperature, to the alloy
- To expand to pre-determined size under load and maintain a secure seal with the container wall, leaving only a thin film of alloy on the liner
- To separate cleanly from the billet at the end of the stroke
- To contract immediately, and return through the container without stripping the film of alloy from the liner
- To cause no gas entrapment that can result in blistering, or damage the face of the container and/or dummy block
- To compensate for minor press misalignment
- To be quickly and easily removed and replaced
- To function effectively until a production run is complete

REPLACEABLE RING BLOCK

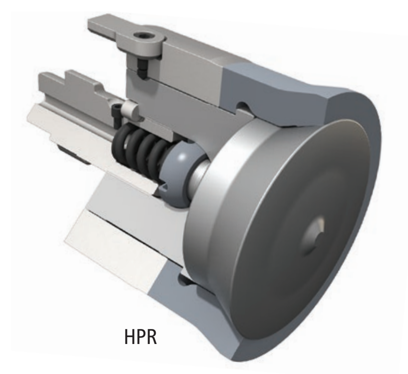
Most wear naturally occurs at the front of the dummy block, on the outer lip of the shell. Castool provides an efficient and cost-effective expanding wear ring that is easily and quickly replaced. Most other components (holder, mandrel and wear ring) can be purchased separately. The economy of the replaceable ring block is soon apparent. The replaceable ring block (RRB) is offered in several designs:

RRB: Replaceable ring block for standard long stroke presses up to 100,000 psi. The combinations of the ring hoop strength and the yield strength of the mandrel and holder have been carefully designed. The ring expands to pre-determined size at a predetermined pressure. It provides long-lasting dummy block elastic expansion and contraction.



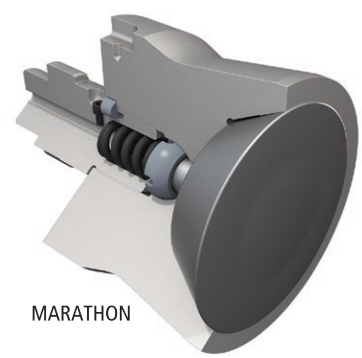
RRB

HPR: A new high-pressure dummy block that incorporates the results of extensive research and development using finite element analysis to improve its performance. The high stress areas are almost eliminated and the dummy block is now able to properly expand and retract repeatedly under high pressure at 120,000 psi and maintain a secure seal with the container wall, leaving a desired thin film of aluminum alloy on the liner. The HPR is especially suited for modern short stroke press or long container design (>1.2m).



HPR

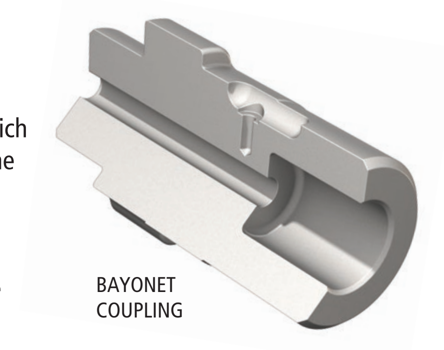
MARATHON (TUFF-TEMPER): This extra strong 2-piece block emphasizes quality of product plus length of operating life. The sturdy design provides excellent long elasticity life and rigidity. Tuff-Temper is a patented steel developed by Castool. It has 3 times more Molybdenum than H13. The amount of Molybdenum increases the yield strength from 156,000 psi to 165,000 psi, elongation from 6.5% to 8.5% and the ultimate tensile strength from 184,000 psi to 196,000 psi at extrusion temperature (800°F). This makes Tuff-Temper stronger and tougher for the dummy block. Tuff-Temper produces two times more carbides, so it has better wear property than H13 as well. The single-use marathon dummy block has no replaceable parts and is not reworkable. It is simply replaced when it loses its ability to retract at the end of each cycle, and remains permanently expanded.



MARATHON

'REDUCED FLOAT' BAYONET COUPLING

Castool uses a unique bayonet-type coupling which locks the dummy block quickly and securely to the stem. This makes it much easier and faster when replacing a HOT block than with a conventional screw-type coupling. Castool uses a secondary stabilizing stud (behind the bayonet), to limit the amount of lateral movement of the block on the stem. The stabilizing stud can reduce the lateral movement from 0.7 mm to 0.2mm.



BAYONET COUPLING

BENEFITS of the Castool Dummy Block

- **Reduce scrap, due to back end blisters and surface defects**
- **Reduce cost of operation**
- **Reduce downtime**
- **Increase productivity**
- **Increase operating life**
- **Increase container liner life**

With these dummy blocks, Castool again sets a new standard of excellence in the extrusion industry.

Results may vary depending on individual press characteristics and setup.

AEC MEMBER ALUMINUM EXTRUDERS COUNCIL

ISO 9001:2015 CERTIFICATION TM QUALITY

ISO 45001:2018 CERTIFICATION TM SAFETY

ISO 14001:2015 CERTIFICATION TM ENVIRONMENT

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Modern Extrusion Presses

Taper heating allows a progressive crush from die to stem; more taper equals more of a progressive crush, and this can only help.

How much taper should be used?

In terms of isothermal control of the process, we believe that for 6063/6060 type extrusions, certainly up to 10C/dm, and at times as high as 20C/dm – depending on the product and of course the exit temperature profile from start to finish of the push. And yes, longer billets typical of front-loading presses will require more taper, in terms of front to back difference, not so much a higher C/dm.

Also, for better control of crush, the higher the taper the better. The buckling risk will be less and most air will be pushed to – and entrapped at the back of – the container, although some may escape during crush, depending on how much the dummy expands under crushing load, and whether or not a seal is created on the container skin at this load. Also, modern presses crush faster. The hydraulic speeds are higher and there may be a dynamic factor involved, where our image of a controlled crush progressing nicely from die to stem, may in reality not happen.

How much the block expands, how much the container expands, whether or not there is a seal between dummy block and container skin, and whether air around the billet can bypass the block during crush, or entrapped air can escape during burp, are all factors to consider.

Air bypassing the block, and whether the burp is effective or not can depend on how much alloy build up there may already be on the dummy block bearing. Build up on the block is a concern, because it may stop air evacuation during burp. However, compressed air is at such a high pressure, that it's difficult to comprehend how it cannot find a way out even with alloy build up. Once more, time might be a factor, and today's faster burp cycles may not help.

We need to better understand the harmony of expansion of both the container and dummy block during an extrude cycle. With front loading presses, we suspect the container expands more than the block, the skin thickens (maybe also blows by the block), and interferes with the dummy block when the stem is drawn back through the container in the dead cycle.

Billet taper is good for high productivity extrusion of the leaner 6060/6063 alloys. Harder alloys like 6061/6082 should be treated with caution, as changing temperature and speed conditions from hotter and slower at the start, to colder and faster at the end of a push, will lead to grain size variation, that can be detrimental to many applications in the harder alloys. But as most business volume is with leaner 6603/6060 alloys, the billet taper isothermal approach works well in general.

Short stroke press manufacturers acknowledge there are issues with dummy block performance and life. They're reluctant to even want to consider that the container may have a part to play, but admit it might be valuable to do tests and better understand. Their stance at this stage is to say that reduced dummy block life is a small trade-off extruders pay for, against the more significant benefits front loading presses give them.

SCHMOLZ + BICKENBACH International

HOT WORK TOOL STEELS

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