MELBOURNE AND METROPOLITAN TRAMWAYS BOARD

ENGINEERING DEPARTMENT

WORKSHOPS AND RUNNINGSHEDS BRANCH

CASTING PRODUCTION AND MACHINING AT PRESTON WORKSHOPS

This investigation was undertaken in order to assess the practicability of using precision casting methods in order to reduce, or eliminate, subsequent hand finishing and machining on certain types of castings.

In addition, higher rates of foundry production may also be possible.

Precision casting methods in general use at present are:-

1. Pressure Die Casting
2. Gravity Die Casting
3. Investment Casting
4. Shell Moulding
5. CO_2 Moulding

Of these methods, gravity die casting and shell moulding seem to be the most suitable for installation at Preston. Gravity die casting has been used in the past and some 10 or 12 dies are in existence. This method has a high productivity rate with excellent surface finish, but does not always lend itself to elimination of subsequent machining. Die sinking costs are high and can only be justified by large quantity production.

Shell moulding requires a heated metal pattern well finished without undercuts, the accuracy of the casting depending upon the accuracy of the pattern. Surface finish is good, and depending upon the pattern, subsequent machining can be considerably reduced, or, in some cases, eliminated. Pattern costs depend upon the part to be produced and the accuracy required. Basic equipment for shell moulding would be-

1. Shell moulding machine
2. Shell core blower
3. Sand-resin mixer
4. Suitable means of cementing shells
5. Suitable storage bins for sand and resins.

Shell moulding and/or shell cores are used by -

International Harvester Geelong
W. O. & B. Adams Pty. Ltd.
Mc Millan & Co.
Shellmould Pty. Ltd.
Webware Pty. Ltd.
Vickers Ruwolt Pty. Ltd.
Demag Products Pty. Ltd.
Chamberlain Industries

Items selected for investigation are those castings, 200 or more of which were produced during the year July 1962, to June 1963. Each of these items were assessed on the basis of practicability of precision casting and subsequent saving in machining time. The number of castings ordered at any one time is important and must be sufficient to justify setting up the machine to produce moulds.

...17

Attached are details of components considered suitable for the above process. A comparison has been made in each case of the pattern equipment and machining processes required for the existing moulding technique and for shell mould -ing. An estimate is given of the saving of machining time.

The outstanding items are suspension bearings and collector shoes. The items examined should enable saving of some 7000 man hours per annum, which is an indication that the economics of such precision casting methods might be closely examined with advantage.

Prepared by J. Scholtz.
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EMERGENCY DOOR LOCK CAMS

Drg. No. R.6839D Folio No. 37/155 R Patt.No. 2039
No. Off 216 per annum.
Existing Pattern Equipment - 12 loose patterns.
Existing Machining -
Hand dress to clean up - Pass to lathe.

Lathe:- Mount on peg using peg to size 5/16" hole.
Face end and one side of cam.
Turn boss to dia to suit lock *
Remove from peg; remount, face second end.
Turn boss to dia to suit lock *

* (New locks - 9/16" dia.
(Reconditioned locks - Up to 5/8" dia.

SHELL MOULDING:

Pattern Equipment - Two plates and 1 core box.

Note: Two plates are required for each boss dia.
A minimum of 12 to be mounted on plate.

Machining - None required.

Estimated saving in machining time - 10 - 15 mins each.
36 - 54 hrs. per annum.

MOTORMAN'S DOOR LOCK

Drg. No. R 3963 F Folio No. 37/131 Patt. No. 1774 and 1775
No. Off 240 per annum
Existing Pattern Equipment - 2 loose patterns each part.
Existing Machining -
Handle Hand dress to clean up - pass to drill
Drill Drill and ream 5/16" hole, drill 1/8" dia. hole.
pass
Body - Hand dress to clean up/to drill.
Drill - Drill and csk 4 holes - pass to fitter.
Fitter- Size tongue slot with punch.

SHELL MOULDING:

Pattern Equipment - Handle - Two plates) Approx. 12 ea.
Body - One plate and core box) on plate

Machining - Handle - Drilling as previously.
Body - No machining required.

Note: At present tongue is manufactured from 5/8" SQ MS machines to 5/8" x 1/2" section 12" long in shaper and then shank is turned to size in lathe. Lock could be re-designed to use 5/8" SQ MS.

Estimated saving time in machining time - 10 minutes ea.
40 hrs per annum.

BUS TREAD PLATES

Drg. No. R 8930 A Folio Nos. 120/76 and 120/77 Patt.No. 4231 and 4233
No. Off 258 and 278 per annum.
Existing Pattern Equipment - 4 loose patterns for each part.
Existing Machining -
Straighten and hand dress if required.

SHELL MOULDING:

Pattern Equipment - One plate and core box or two plates, 4 ea. item on plate.

Machining - None required.

Estimated saving time in maching time - Nil.

SMOKERS SEAT LEG FLANGES

Drg. No. R3188 F Folio No. 37/561 Patt. No. 4428
No. Off 264 per annum.
Existing Pattern Equipment - 4 loose patterns.
Existing Machining -
Hand dress to clean up - pass to drill.
Drill - Clean up two csk holes - drill 3/4" dia hole in boss. Pass to fitter
Fitter- Tap flanges required 1/2" B.S.P.

SHELL MOULDING

Pattern equipment - One plate Approx 12 per plate
Machining - Tap 1/2" B.S.P. holes as required.
Note: Die is available for gravity die casting of this item.
Estimated saving in machining time, 20 mins. ea. 88 hrs. per annum.

7" EARS

Drg. No. 013-116 Patt. Nos. 4493 and 4494
No. Off 200 each per annum.
Existing Pattern Equipment - 2 loose patterns of each item.
Existing Machining - Body - Hand dress to clean up - pass to mill.
Mill - Mill trolleywire groove using formed cutter - pass to lathe.
Lathe - Turn stud and screw - pass to drill.
Drill - Drill and c'bore holes using drill jig.
Machining (cont'd) Side - hand dress to clean up - pass to mill
Mill - Mill trolley wire groove using formed cutter - pass to drill.
Drill - Drill and tap holes using drill jig.

SHELL MOULDING:

Pattern Equipment - Body - Two Plates Side - One Plate
Machining - Body - Screw Stud) Estimating saving 1 hr. per assy.
Side - Tap Holes) 200 hrs. per annum.

REAR VISION MIRROR PIVOTS

Drg. No. R 5837 Folio No. 37/146 Patt. No. 1621
No. Off 200 per annum.
Existing Pattern Equipment - 2 Sticks, 10 per stick.
Existing Machining - Hand dress angle to fit fixture.
Mount fixture in capstan and turn spindle.

SHELL MOULDING:

Pattern Equipment - One plate one core box approx. 50 per plate.
Machining - Not required.
Estimated saving in maching time, 10 mins. ea. 33 hrs. per annum.

AIR HOSE CLIPS AND CONNECTIONS

Patt. Nos. 2279 and 2297 . No. Off 240 per annum.
It is recommended that the purchase of a suitable proprietary item be considered and manufacture at Preston be discontinued.

STANCHION BRACKET R.H. AND L.H.

Drg. No. R 7489C Folio Nos. 37/154 & 37/155 Patt.Nos.1958 & 1959
No. Off 216 each per annum.
Existing Pattern Equipment - 4 loose patterns of each RH & LH on plaster oddside.
Existing Machining - Hand dress to clean up - pass to lathe.

Lathe - Grip in 3 jaw chuck, true, and bore boss to suit "Doverite" covered tube. Pass to drill.
Drill - Drill 2 holes in flange using jig.

SHELL MOULDING:

Pattern Equipment - Two plates and core box for part as drawn, with re-design of part, two parts only would be required. Approx. 12 on plate.
Machining - Drill 2 holes in flange using jig.
Estimated saving in machining time - 20 mins ea. 72 hrs. per annum.

10" CURVE EARS

Drg. No. C-610F Folio No. 68/20 Patt. No. 3276
No. Off 300 per annum.
Existing Pattern Equipment - 3 loose patterns
Existing Machining - Hand dress to clean up - pass to mill.

Mill - Mill trolley wire groove using formed cutter - pass to drill.
Drill - Drill holes and csk holes using drill jig - pass to lathe.
Lathe - Turn stud and screw.

SHELL MOULDING:

Pattern Equipment - Two plates 4 mounted on plate
Machining - Screw stud only
Estimated saving in machining time - 3/4 hr. ea. 225 hrs per annum.

COLLECTOR SHOES

Drg. No. R9354 K Folio No. 45/24 Patt. No. 4091
No. Off 2000 per annum.
Existing Pattern Equipment - 4 loose patterns with plaster oddside and necessary core box.
Existing Machining - Hand dress to clean up - pass to slotter.

Slotter - Machine dovetail Pass to drill
Drill - Drill and tap hole using jig - pass to fitter.
Fitter - File to fit carbon insert.

SHELL MOULDING:

Pattern Equipment - Two plates and one core box Approx. 12 on plate
Machining - ~~Approx 12 on plate.~~ Drill and tap hole using jig.
No other machining required.
Estimated saving in machining time - 1½ hrs. ea. 2,500 hrs per annum.

BOLSTER SPRING PACKING PIECES

Drg. No. R 4558 F Patt. No. 2623
No. Off 200 per annum.
Existing Pattern Equipment - 3 loose patterns
Existing Machining - Not required.

SHELL MOULDING:

Pattern Equipment - One plate and core box 4 to 6 on plate.
Machining - Not required.
Estimated saving in machining time - Nil.

SUSPENSION BEARINGS (ALL TYPES)

No. Off 2722 prs. per annum. (all types)
Existing Pattern Equipment -
13 plate patterns to cover all types (26 in all) each plate having 2 half bearings.
Existing Machining -

Shaper - Machine joint face - pass to joining.
Joining - Sweat 2 half bearings together - pass to 1st operation turret lathe.
1st Operation Turret lathe - Grip in 4 jaw chuck, turn flange O.D. and face, counter bore end and radius - pass to 2nd Op.turret
2nd Operat. Turret - Grip on machined flange, turn O.D. and bore I.D. one operation, face back face of flange and machine body to length - Pass to drill.
Drill - Drill dowel holes using jig - pass to disassembly.
Disassembly - Heat and separate halves, wire brush joint face - pass to fitters.
Fitters - Cut oil grooves in face and bore. Break corners.

SHELL MOULDING:

Pattern Equipment - One plate and core box for each size of bearing produced.

Note: With metal spraying to build up worn axles, gear boss faces, motors, No. of patterns required would be 4, without reclaimation of worn parts by metal spraying the No. of patterns required would be approx. 25 to 30.)

Machining - Turret-load bearings into fixture mounted on lathe face plate, clamp, machine xmx bore and face flange - pass to fitters.
Fitters-Cut oil grooves in face and bore. Break corners

Estimated saving in machining time 1½ hrs. 4,083 hrs. per annum.

SPRING ROLLER BRACKET (PLAIN)

Drg. No. R 9671 Folio No. 37/546 Patt. No. 3747
No. Off 288 per annum.
Existing Pattern Equipment - 10-12 loose patterns
Existing Machining - Hand dress to clean up - pass to lathe

Lathe - Drill ½" Dia.Hole - pass to drill
Drill - Drill 3 - 9/64" Dia. Holes and c'sk.

SHELL MOULDING:

Pattern Equipment - One plate - approx 12 on plate.
Machining - None required.

Estimated saving time - 10-15 mins. ea. 48 to 72 hrs. per annum.

10" FEMALE EARS

Drg. No. 0-6893 Folio No. 68/16 Patt. No. 3278
No. Off 200 per annum.
Existing Pattern Equipment - 3 loose patterns
Existing Machining - Hand dress to clean up - pass to mill.

Mill - Mill trolley wire groove using formed cutter pass to drill
Drill - Drill holes and c'sk holes using drill jig. Drill tapping size hole in boss. Pass to Fitter
Fitter - Tap boss 3/4" B.S.W.

SHELL MOULDING:

Pattern Equipment - Two plates and core box - 4 mounted on plate
Machining - Tap 3/4" B.S.W. Hole
Estimated saving time 3/4 hr.ea.150 hrs. per annum.

APPENDIX

WEDGES FOR CARBORUNDUM BRAKE SHOES

Patt. No. 404 (Similar to Drg. R10-033)

No. Off 250 per annum.

Existing Pattern Equipment - 5 loose patterns
Existing Machining - Mark Off - Drill 1 hole and counter bore
Hand grind on taper face to clean up.

SHELL MOULDING:

Pattern Equipment - One plate and core box. Approx. 12 on plate.

Machining - None required.

Estimated saving in machining time ¼ hr. ea. 63 hrs. per annum.
