

FUNDAMENTAL MANUFACTURING PROCESSES

Plastic Injection Molds

SCENE 1.

IM76A, GRAPHIC: Review
white text on black
IM76B, review music
IM76C, peter carey narration

SCENE 2.

IM77A, **tape 912**, **07:25:26-07:25:53**
zoom in, plastic cooling in mold,
mold opens, part ejected, mold
closing
IM77B, CGS: Determining the Shape
of the Desired Part or
Parts
Venting Trapped Air or
Gas During Injection
Acting as a Heat
Exchanger to Draw Heat
Immediately Away from
the Molten
Thermoplastic that
Forms the Parts
Ejecting the Cooled
Parts

NARRATION (VO) :

THE PLASTIC INJECTION MOLD SERVES SEVERAL
PURPOSES DURING THE MOLDING CYCLE, INCLUDING:
DETERMINING THE SHAPE OF THE DESIRED PART OR
PARTS,
VENTING TRAPPED AIR OR GAS DURING INJECTION,
ACTING AS A HEAT EXCHANGER TO DRAW HEAT
IMMEDIATELY AWAY FROM THE MOLTEN THERMOPLASTIC
THAT FORMS THE PARTS,
AND EJECTING THE COOLED PARTS.

SCENE 3.

IM78A, **tape 421**, **15:03:39-15:03:48**
two plate mold opening
IM78B, **tape 424**, **18:02:31-18:02:37**
three plate mold opening
IM78C, **tape 415**, **10:15:39-10:15:45**
part pulled from big mold
IM78D, **tape 910**, **05:10:13-05:10:24**
pan down mold base
IM78E, CGS: Mold Base
IM78F, **tape 916**, **11:27:50-11:27:56**
IM78G, CGS: Mold Cavity
IM78H, **tape 917**, **12:04:30-12:04:36**
c.u. mold core
IM78I, CGS: Mold Core
IM78J, **tape 422**, **16:24:16-16:24:21**
zoom out, sprue bushing
IM78K, CGS: Sprue Bushing
IM78L, **tape 917**, **12:10:12-12:10:19**
pan, runner system
IM78M, CGS: Runner System
IM78N, **tape 917**, **12:08:13-12:08:19**
c.u. mold gate
IM78O, CGS: Gates

NARRATION (VO) :

INJECTION MOLDS ARE AVAILABLE IN A WIDE
VARIETY OF DESIGNS AND SIZES, AND ARE ALL
CONSTRUCTED USING VARIOUS STANDARD COMPONENTS,
INCLUDING:
THE MOLD BASE...,
MOLD CAVITY...,
MOLD CORE...,
SPRUE BUSHING...,
RUNNER SYSTEM...,
GATES...,
VENTS...,

IM78P, tape 425, 19:06:32-19:06:41
zoom out, mold vent
IM78Q, CGS: Vents
IM78R, tape 916, 11:03:18-11:03:26
zoom out, mold cooling system
IM78S, CGS: Cooling System
IM78T, tape 916, 11:14:55-11:15:06
ejector system of mold
IM78U, CGS: Ejector System

A COOLING SYSTEM...,
AN EJECTOR SYSTEM,
AND MANY MORE COMPONENTS.

--- TOUCH BLACK ---

SCENE 4.

IM79A, tape 912, 07:07:34-07:07:43
zoom out, mold halves on table
IM79B, CGS: A Half
IM79C, tape 911, 06:08:14-06:08:25
zoom out, 'a' half of mold mounted
onto injection molding machine
IM79D, CGS: B Half
IM79E, tape 911, 06:06:43-06:06:55
zoom out, 'b' half of mold mounted
onto injection molding machine

NARRATION (VO) :

THE BASIC, STANDARD MOLD BASE CONSISTS OF TWO
HALVES:
THE 'A' HALF, WHICH IS ALSO REFERRED TO AS THE
STATIONARY HALF, OR THE INJECTION HALF...,
AND THE 'B' HALF, WHICH IS ALSO REFERRED TO AS
THE MOVING HALF, OR THE EJECTOR HALF.

SCENE 5.

IM80A, tape 424, 18:12:15-18:12:26
zoom in, mold halves close for
injection
IM80B, CGS: Mold Cavity
IM80C, tape 911, 06:03:18-06:03:30
zoom out, cavity mounted in 'a' half
of mold on injection molding machine
IM80D, CGS: Mold Core
IM80E, tape 911, 06:02:56-06:03:05
zoom out, core mounted in 'b' half
of mold on injection molding machine
IM80F, tape 912, 07:01:10-07:01:20
mold halves on table
IM80G, CGS: Cavity Set

NARRATION (VO) :

THE MACHINED COMPONENTS THAT REPRODUCE THE
IMAGE OF THE PART TO BE MOLDED INCLUDE:
THE MOLD CAVITY, WHICH IS USUALLY MOUNTED ON
THE 'A' HALF OF THE MOLD...,
AND THE MOLD CORE, WHICH IS USUALLY MOUNTED ON
THE 'B' HALF OF THE MOLD...,
COLLECTIVELY THE MOLD CAVITY AND CORE ARE
REFERRED TO AS THE 'CAVITY SET'.

SCENE 6.

IM81A, tape 422, 16:10:06-16:10:19
zoom out, mold with regular parting
line opening, part ejected, mold
closing
IM81B, tape 400, 06:05:26-06:05:45
mold with irregular parting line

NARRATION (VO) :

THE INTERFACING PLANE BETWEEN THE 'A' AND 'B'
HALVES OF THE MOLD IS KNOWN AS THE PRIMARY
PARTING LINE. DEPENDING ON THE COMPLEXITY OF
THE MOLDED PART, THERE MAY BE MORE THAN ONE
PARTING LINE.

SCENE 7.

IM82A, tape 911, 06:24:24-06:24:52

mold being mounted to molding machine, secured with clamps

NARRATION (VO) :

MOLD HALVES ARE MOUNTED TO THE INJECTION MOLDING MACHINE AND SECURED BY CLAMPS WHICH ARE BOLTED INTO TAPPED HOLES LOCATED IN THE MACHINE'S PLATENS.

SCENE 8.

IM83A, tape 424, 18:23:43-18:23:52

c.u. nozzle entering sprue bushing

NARRATION (VO) :

ONCE THE MOLD IS SECURED, THE NOZZLE OF THE HEATING CYLINDER IS SEATED TIGHTLY AGAINST THE SPRUE BUSHING ON THE 'A' HALF OF THE MOLD.

SCENE 9.

IM84A, CGS: Sprue Bushing

IM84B, tape 422, 16:26:12-16:26:22
zoom in to c.u. of sprue bushing

IM84C, tape 422, 16:23:58-16:24:07
zoom in, mold half showing sprue bushing, runner system stopping at gate of mold

NARRATION (VO) :

THE SPRUE BUSHING HAS A SPHERICAL RADIUS ON IT'S FACE TO TIGHTLY SEAT THE INJECTION MACHINE'S CYLINDER NOZZLE, AND A TAPERED HOLE THROUGH ITS CENTER. THIS DIRECTS MOLTEN MATERIAL FROM THE CYLINDER NOZZLE INTO THE MOLD'S RUNNER SYSTEM, OR DIRECTLY INTO THE MOLD'S CAVITY.

SCENE 10.

IM85A, CGS: Runner System

IM85B, tape 422, 16:17:21-16:17:39
c.u. pan of mold half showing runner system stopping at gate of mold

NARRATION (VO) :

A MOLD'S RUNNER SYSTEM IS THE CHANNEL OR CHANNELS THROUGH WHICH THE MELTED THERMOPLASTIC FLOWS TO REACH THE CAVITY SET.

SCENE 11.

continue previous shot

IM86A, CGS: Gate

IM86B, GRAPHIC: arrow pointing right
IM86C, GRAPHIC: arrow pointing left

NARRATION (VO) :

THE MELTED THERMOPLASTIC THEN ENTERS THE CAVITY SET THROUGH AN INTERFACE CALLED THE GATE.

SCENE 12.

IM87A, tape 422, 16:20:45-16:21:06

c.u. pan of vents in mold

NARRATION (VO) :

IM87B, tape 917, 12:06:43-12:06:53
zoom in, vent of mold
IM87C, CGS: Vents

AS MELTED THERMOPLASTIC ENTERS THE MOLD CAVITY, TRAPPED AIR AND PROCESSING GASES NEED TO BE REMOVED OR THEY WILL COMPRESS, IGNITE AND CHAR THE PLASTIC. THIS REMOVAL IS ACHIEVED USING VENTS THAT ARE GROUNDED ON THE PARTING LINE OF THE MOLD.

SCENE 13.

IM88A, tape 422, 16:06:23-16:06:48
zoom in, mold closed during injection, solidification, opening, part ejected

NARRATION (VO) :

AFTER THE MOLTEN THERMOPLASTIC IS INJECTED INTO THE MOLDS CAVITY, IT IS ALLOWED TO STAY UNDER PRESSURE UNTIL SUFFICIENTLY COOLED AND SOLIDIFIED FOR EJECTION.

SCENE 14.

IM89A, tape 916, 11:06:04-11:06:21
zoom out, cooling lines
IM89B, CGS: Cooling System

NARRATION (VO) :

COOLING OF THE THERMOPLASTIC IS MOST COMMONLY ACHIEVED USING A COOLING SYSTEM CIRCULATING WATER WITHIN CHANNELS MACHINED INTO THE MOLD.

SCENE 15.

IM90A, tape 400, 06:12:18-06:12:36
mold with cooling lines, opening expelling part

NARRATION (VO) :

THE SPEED OF THE INJECTION MOLDING PRODUCTION CYCLE IS CONTROLLED BY THE EFFICIENCY OF THIS COOLING SYSTEM. ASIDE FROM PRODUCING ACCEPTABLE PARTS, EFFICIENT COOLING IS THE MOST IMPORTANT FACTOR OF THE INJECTION MOLDING PROCESS.

SCENE 16.

IM91A, tape 415, 10:25:40-10:26:01
mold with part cooling in it, mold opening ejecting part, dissolve to next shot
IM91B, CGS: Ejector System
IM91C, tape 415, 10:26:05-10:26:24
part removed from mold, mold closing

NARRATION (VO) :

ONCE THE PRESSURIZED THERMOPLASTIC IS SUFFICIENTLY COOLED AND SOLIDIFIED, THE MOLD OPENS, AND AN EJECTOR, OR KNOCK OUT, SYSTEM IS USED TO AID IN PART EJECTION.

--- TOUCH BLACK ---

SCENE 17.

IM92A, tape 424, 18:01:33-18:01:41

zoom out, cold-runner three plate mold operating

IM92C, tape 725, 12:28:53-12:29:02

zoom out, hot runner mold operating

IM92B, tape 424, 18:11:35-18:11:57

zoom in, cold-runner two-plate mold operating

IM92D, CGS: Cold-Runner Two-Plate

Mold

IM92E, ANI: cold-runner two-plate

mold

IM92F, CGS: Cold-Runner Three Plate

Mold

IM92G, ANI: cold-runner three-plate

mold

IM92H, CGS: Hot-Runner Mold

IM92I, ANI: hot-runner mold

IM92J, CGS: Insulated Runner Mold

IM92K, ANI: wide, insulated runner

mold

NARRATION (VO) :

MANY DIFFERENT MOLD TYPES HAVE BEEN DEVELOPED

THAT MEET SPECIFIC INJECTION MOLDING

REQUIREMENTS. THESE MOLD DESIGNS INCLUDE:

THE COLD-RUNNER TWO-PLATE MOLD...,

THE COLD-RUNNER THREE PLATE MOLD...,

THE HOT-RUNNER MOLD...,

AND THE INSULATED RUNNER MOLD.

SCENE 18.

IM93A, tape 913, 08:22:01-08:22:14

damaged mold being welded

NARRATION (VO) :

OVER TIME, ALL MOLDS WILL REQUIRE A CERTAIN

AMOUNT OF REPAIR FOR DAMAGE THAT OCCURS DURING

THE USE AND STORAGE OF THAT MOLD.

SCENE 19.

IM94A, tape 906, 01:21:25-01:21:37

zoom out, damaged mold

IM94B, CGS: Bent or Broken Ejector

Pins

Worn Gate Areas

Peened Parting Lines

IM94C, tape 913, 08:13:50-08:14:00

zoom out, mold with rust

NARRATION (VO) :

MOLD DAMAGE THAT COMMONLY OCCURS DURING USE

INCLUDES BENT OR BROKEN EJECTOR PINS,

WORN GATE AREAS,

AND PEENED PARTING LINES.

THE DAMAGE MOST COMMON DURING STORAGE IS THE

FORMATION OF RUST.

SCENE 20.

IM95A, tape 913, 08:12:42-08:13:05

zoom out, mold being cleaned,

lubricated

NARRATION (VO) :

PREVENTATIVE MAINTENANCE IN THE FORM OF

CLEANING AND LUBRICATION IS ALSO ESSENTIAL IN

Copyright © 2004 Society of Manufacturing Engineers

MINIMIZING MOLD DAMAGE.

--- FADE TO BLACK ---