SCENE 1.
CG: Die Casting Machines
white text centered on black

SCENE 2.
tape 445, 12:06:10-12:06:19
zoom out, horizontal die casting machines
tape 443, 09:11:47-09:11:55
pan, horizontal die casting machine
tape 465, 01:20:57-01:20:20
vertical die casting machine

NARRATION (VO):
THERE ARE SEVERAL TYPES OF DIE CASTING MACHINES IN
USE TODAY. MOST OF THESE MACHINES ARE
HYDRAULICALLY ACTUATED AND OPERATE HORIZONTALLY,
BUT VERTICALLY OPERATING MACHINES ARE ALSO
UTILIZED.

SCENE 3.
continue previous shot
tape 445, 12:03:35-12:03:44
horizontal machine injecting metal

NARRATION (VO):
THE PRINCIPAL DIFFERENCE BETWEEN VERTICAL..., AND HORIZONTAL DIE-CASTING MACHINES IS, AS THE
TERMS IMPLY, THE DIRECTION OF METAL INJECTION INTO
THE DIE.

SCENE 4.
tape 464, 09:13:55-09:14:02
c.u. injection system
CG, SUPER: Injection System
tape 445, 12:16:40-12:16:50
pan, clamping system
CG, SUPER: Clamping System

NARRATION (VO):
ALL DIE CASTING MACHINES INCLUDE A METAL-INJECTION
SYSTEM TO GET THE METAL IN THE DIE,
AND A CLAMPING SYSTEM TO KEEP THE DIE HALVES
CLOSED DURING INJECTION.

SCENE 5.
tape 442, 08:05:09-08:05:16
hot-chamber die casting machine
tape 468, 00:09:00-00:10:00
blue background
CG: Hot-Chamber Machine
Cold-Chamber Machine

NARRATION (VO):
THE TWO PRINCIPAL TYPES OF DIE CASTING MACHINES
ARE:
THE HOT-CHAMBER..., AND COLD-CHAMBER TYPE.
SCENE 6.
CG, SUPER: Hot-Chamber Machine
tape 445, 12:04:22-12:04:36
hot-chamber die casting machine

NARRATION (VO):
The hot-chamber machine is used mainly for die-casting zinc and other metals of low melting temperature. However, it is also used to die-cast magnesium.

SCENE 7.
tape 462, 06:06:31-06:06:42
pan of holding pot
tape 442, 08:07:37-08:07:48
c.u. plunger
tape 473, 00:01:18-00:01:28
GRAPHIC: cutaway of hot-chamber machine, injection system highlighted

NARRATION (VO):
The machine's shot or charge end has a holding pot, which is a reservoir for the molten metal seated in a furnace, and an injection system for transferring the metal through a gooseneck-shaped pipe to the die.

SCENE 8.
tape 462, 06:05:57-06:06:14
pull back from plunger, injection system submerged in holding pot

NARRATION (VO):
The plunger end of the injection system and the lower portion of the transfer pipe are submerged in the molten metal. For this reason, aluminum and copper alloys are unsuitable for use, since they chemically attack or erode the submerged injection system.

SCENE 9.
tape 473, 00:02:16-00:02:23
ANI: cutaway of hot-chamber machine showing the injection system, plunger rising, charge of metal entering the pipe through a port, plunger stopping, add white burst
tape 473, 00:02:26-00:02:40
ANI: plunger then descending, closing the port and driving the charge through a nozzle at the end of the pipe and into the die

NARRATION (VO):
When the plunger rises, a charge of metal enters the pipe through a port. When the plunger descends, it closes the port and drives the charge through a nozzle at the end of the pipe and into the die.

SCENE 10.
tape 442, 08:08:00-08:08:09
c.u. plunger descending, then rising

NARRATION (VO):
Injection pressures may range from 1,500 to more
THAN 4,500 POUNDS PER SQUARE INCH OR 10 TO 31 MEGA PASCALS.

--- TOUCH BLACK ---

SCENE 11.
CG, SUPER: Cold-Chamber Machine
tape 450, 17:02:12-17:02:22
cold-chamber die casting machine

NARRATION (VO):
THE COLD-CHAMBER MACHINE IS USED PRIMARILY TO DIE-CAST THE ALUMINUM, MAGNESIUM, AND COPPER ALLOYS.

SCENE 12.
tape 444, 11:14:35-11:15:08
zoom in from ladle system to pouring of shot

NARRATION (VO):
IN THE COLD-CHAMBER MACHINE, THE CHARGE IS SUPPLIED BY LADLE OR FEED SYSTEM FROM AN EXTERNAL FURNACE SOURCE TO A HOLDING POT AT THE SHOT END OF THE MACHINE. THE FEED SYSTEM COMPONENTS ARE NOT SUBMERGED IN THE MOLten METAL.

SCENE 13.
continue previous shot

NARRATION (VO):
THE CHARGE IS POURED AHEAD OF THE PLUNGER TIP THROUGH A POUR HOLE IN THE SHOT SLEEVE. AS THE PLUNGER ADVANCES, IT Closes THE POUR HOLE AND DRIVES THE MOLten METAL INTO THE DIE.

SCENE 14.
tape 464, 09:15:00-09:15:18
c.u. cold-chamber plunger injecting metal

NARRATION (VO):
INJECTION PRESSURES MAY RANGE TO 10,000 Pounds per Square Inch or 69 MEGA PASCALS FOR ALUMINUM AND MAGNESIUM, ALTHOUGH SOME MACHINES CAN PROVIDE STILL GREATER PRESSURES.

SCENE 15.
tape 468, 00:07:45-00:08:09
ANI: plunger thrusting forward to release casting

NARRATION (VO):
DIE. THIS PUSHES THE BISCUIT THAT SOLIDIFIES AT THE END OF THE SHOT SLEEVE, ASSISTING CASTING RELEASE.

--- TOUCH BLACK ---

SCENE 16.
tape 464, 09:01:20-09:01:26
static, accumulator, highlight accumulator
tape 441, 07:06:20-07:06:32
zoom in, plunger descending on hot chamber system

NARRATION (VO):

BOTH HOT-CHAMBER AND COLD-CHAMBER MACHINES OFTEN UTILIZE ONE OR MORE ACCUMULATORS TO BOOST INJECTION PRESSURE FOR DIE CASTING.

SCENE 17.
tape 464, 09:03:53-09:04:11
zoom in, pressure gauge on accumulator

NARRATION (VO):

AN ACCUMULATOR IS A CYLINDRICAL PRESSURE VESSEL CHARGED WITH INERT GAS, USUALLY NITROGEN, WHICH STORES HYDRAULIC FLUID AT A PRESSURE REQUIRED FOR RAPID, HIGH-PRESSURE INJECTION.

SCENE 18.
tape 450, 17:15:08-17:15:18
pan from intensifiers to machine plunger being driven forward
tape 450, 17:15:31-17:15:44
zoom in, digital pressure readout increasing
tape 450, 17:07:17-17:07:25
wide, cold chamber plunger driven forward

NARRATION (VO):

PRESSURE INTENSIFIERS ALSO CAN BE USED TO INCREASE INJECTION PRESSURE. THESE GROUPS OF HYDRAULIC CYLINDERS CAN DOUBLE, EVEN QUADRUPLE, PRESSURE BY APPLYING HIGH FORCE THROUGH A SHORT DISTANCE AT THE END OF THE PLUNGER STROKE. THIS PACKS THE MOLTEN METAL MORE TIGHTLY INTO DIE-CAVITY DETAILS.

--- TOUCH BLACK ---

SCENE 19.
tape 464, 09:17:00-09:17:12
wide, clamping system releasing pressure, dies separating

NARRATION (VO):

THE CLAMPING SYSTEM OF THE DIE CASTING MACHINE CAN BE FULLY HYDRAULIC, MECHANICAL, PNEUMATIC OR A COMBINATION OF THESE SYSTEMS.

SCENE 20.
tape 445, 12:17:08-12:17:20
toggle system on die cast machine

SCENE 21.
CG, SUPER: Clamping-Force Capacity
tape 442, 08:23:41-08:23:55
casting removed, dies clamped shut
CG, SUPER: Shot-Weight Capacity
tape 464, 09:13:11-09:13:19
shot being poured into cold chamber system

SCENE 22.
tape 463, 07:10:37-07:10:54
static of dies on platens, highlight platens

SCENE 23.
tape 442, 08:23:01-08:23:10
dies closing for injection of part
tape 468, 00:09:00-00:10:00
blue background
CG: Stationary Platen
Movable Platen

SCENE 24.
tape 463, 07:09:11-07:09:22
zoom in, stationary platen holding the cover die half
tape 445, 12:09:00-12:09:12
zoom out, hole in stationary plate

SCENE 25.
tape 463, 07:11:59-07:12:07
zoom in, movable platen holding the ejector die half
tape 463, 07:14:52-07:14:58
movable platen sliding closed on ways

THE MOST COMMON CLAMPING METHOD USES COMPOUND TOGGLES WITH A HYDRAULIC CYLINDER TO PROVIDE THE FULL CLAMPING FORCE.

NARRATION (VO):
DIE CASTING MACHINES ARE TYPICALLY RATED BY CLAMPING-FORCE CAPACITY. THIS IS THE AMOUNT OF FORCE THE MACHINE CAN PROVIDE TO RESIST THE PRESSURE GENERATED DURING METAL INJECTION. MACHINES ALSO MAY BE RATED BY THE SHOT-WEIGHT CAPACITY OF THE INJECTION SYSTEM.

NARRATION (VO):
The die halves are attached to platens on the die casting machine.

NARRATION (VO):
These platens are large thick blocks of steel which will not deflect during injection. They include the stationary platen, and the movable platen.

NARRATION (VO):
The stationary platen holds the die half that is called the cover half. This platen has a hole directly in line with the metal injection cylinder.

NARRATION (VO):
The movable platen holds the other die half, called the ejector half. This movable platen slides back and forth on ways.
SCENE 26.
tape 442, 08:22:32-08:22:46
die halves separating, ejector pins releasing casting

NARRATION (VO):
WHEN THE METAL HAS SOLIDIFIED AND THE DIE HALVES SEPARATE, MECHANICALLY OR HYDRAULICALLY ACTUATED EJECTOR PINS RELEASE THE CASTING FROM THE EJECTOR HALF OF THE DIE.

SCENE 27.
tape 462, 06:02:20-06:02:30
die halves being lubricated before closing

NARRATION (VO):
BEFORE CLOSING, THE DIE HALVES ARE LUBRICATED BY EXTERNAL SPRAYS TO ASSIST IN COOLING, CASTING RELEASE AND TO MINIMIZE DIE WEAR.

SCENE 28.
tape 464, 09:08:47-09:08:55
zoom in, lubricant applied manually
tape 462, 06:04:45-06:04:53
lubricant applied automatically

NARRATION (VO):
LUBRICANTS, USUALLY WATER-SOLUBLE, CAN BE MANUALLY APPLIED..., BUT ARE OFTEN SPRAYED AUTOMATICALLY USING CENTRAL DIE SPRAY SYSTEMS.

SCENE 29.
tape 450, 17:10:01-17:10:12
lubricant applied automatically, blast of air applied afterwards

NARRATION (VO):
THE APPLICATION OF DIE SPRAY IS USUALLY FOLLOWED BY AN AIR BLAST TO BLOW OFF RESIDUAL WATER, AND TO REMOVE ANY LOOSE METAL LEFT FROM THE PREVIOUS SHOT.

--- TOUCH BLACK ---

SCENE 30.
tape 464, 09:09:45-09:09:51
casting removed with tongs
tape 445, 12:15:27-12:15:37
casting dropped onto a conveyor
tape 440, 06:01:43-06:01:54
casting removed using automatic extractors, then spraying die

NARRATION (VO):
AFTER RELEASE FROM THE DIE, THE CASTING CAN BE REMOVED MANUALLY WITH TONGS..., OR DROPPED ONTO A CONVEYOR OR DOWN A CHUTE FOR TRANSFER FROM THE MACHINE..., OR REMOVED USING AUTOMATIC EXTRACTORS. THESE
EXTRACTORS ARE COMMONLY USED AND OFTEN PROVIDE AUTOMATIC DIE SPRAY LUBRICATION.

NARRATION (VO):
IN ONE AUTOMATIC EXTRACTION SYSTEM, A ROBOTIC ARM REMOVES A CASTING, AND SPRAYS THE DIE HALVES..., THE ARM THEN ROTATES, PRESENTS THE CASTING TO A CONVEYOR SYSTEM RUNNING THROUGH A QUENCHING TANK, AND RETURNS TO ITS FORMER POSITION FOR THE NEXT CASTING.

NARRATION (VO):
THE CASTING PASSES THROUGH THE QUENCHING TANK AND IS CONVEYED TO A TRIMMING PRESS WHERE AN OPERATOR TRIMS THE CASTING OF EXCESS METAL.

NARRATION (VO):
THESE TRIMMINGS FALL ONTO A CONVEYOR THAT RETURNS THEM TO THE MELT FURNACE FOR REMELTING.

--- TOUCH BLACK ---

NARRATION (VO):
BOTH HOT- AND COLD-CHAMBER DIE CASTING SYSTEMS CAN BE FULLY AUTOMATED TO EXECUTE OPERATIONS BY PROGRAMMED COMMANDS, WHICH CAN BE STORED IN THE SYSTEM COMPUTER AND RECALLED AT ANY TIME.

NARRATION (VO):
MANY PROCESS PARAMETERS, SUCH AS INJECTION SPEED, DIE TEMPERATURE AND CLAMPING FORCE, CAN BE CONTINUALLY MONITORED DURING THE CASTING CYCLE TO
ENSURE QUALITY DIE CASTINGS. PROCESS PARAMETERS CAN ALSO BE RECORDED FOR QUALITY ASSURANCE, AND USED FOR STATISTICAL PROCESS CONTROL.

--- FADE TO BLACK ---