

FUNDAMENTAL MANUFACTURING PROCESSES

Sheet Metal Stamping Dies & Processes-SD

SCENE 1.

FMP01A, CGS: FBI warning
text centered on black to transparent
gradient

FMP BKG, motion background

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SCENE 2.

continue motion background

FMP02A, CGS: DRL screen
text centered on black to transparent
gradient

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SCENE 3.

continue motion background

FMP03A, CGS: disclaimer
white text, centered on background

Always read the operating manual and
safety information provided by the
manufacturer before operating any
manufacturing equipment.

Make sure all machine guards are in
place, and follow all safety procedures
when working with or near manufacturing
equipment.

SCENE 4.

FMP SME, SME logo open, with music

SCENE 5.

FMP05A, FMP open, with music
SD05B, edited peter carey narration

MUSIC UP AND UNDER

NARRATION (VO) :

THE FUNDAMENTAL MANUFACTURING PROCESSES
VIDEO SERIES, EXAMINING THE TOOLS AND
TECHNIQUES OF PRECISION MANUFACTURING.

SCENE 6.

continue FMP open

NARRATION (VO) :

SD06A, CGS: Sheet Metal Stamping Dies &
Processes
white text, centered on background
FMP06B, blue background
FMP06C, sound slug

SCENE 7.

SD07A, **SME4427**, 15:14:59:00-15:15:06:00
c.u. stamping operation, emphasis on die
set
SD07B, **SME4427**, 15:19:14:00-15:19:30:00
c.u. stamping operation, emphasis on die
set
SD07C, **SME4427**, 15:59:41:00-15:59:49:00
c.u. stamping operation, emphasis on die
set
SD07D, **SME4003**, 02:01:20:00-02:01:26:00
die making in shop
SD07E, **SME4002**, 01:36:22:00-01:36:32:00
die making in shop
SD07F, **SME4427**, 15:49:00:00-15:49:10:00
die making in shop
SD07G, **SME4226**, 14:27:41:08-14:27:50:00
die making in shop

SCENE 8.

SD08A, **SME4392**, 01:21:49:00-01:22:20:00
stamping dies being mounted in press
SD08B, **SME2693**, 01:26:11:00-01:26:19:00
blank fed stamping operation
SD08C, **SME4421**, 12:02:40:00-12:02:55:00
coil fed stamping operation

SCENE 9.

SD09A, **SME2694**, 02:04:36:00-02:04:48:00
stamping operation

SCENE 10.

SD10A, **SME4427**, 15:33:26:00-15:33:33:00
sheet metal being stamped
SD10B, **SME4427**, 15:44:52:00-15:44:02:00
sheet metal being stamped

THIS PROGRAM EXPLORES STAMPING DIES AND
THE PROCESSES WHICH FORM PARTS FROM
SHEET METAL.

NARRATION (VO) :

STAMPING DIES ARE THE TOOLS THAT SHAPE
AND CUT SHEET METAL PARTS. DIES ARE
TYPICALLY DEVELOPED USING COMPUTER-AIDED
DESIGN, OR CAD, SOFTWARE AND ANALYTICAL
PROGRAMS TO CREATE AND PROVE-OUT HIGHLY
ACCURATE, UNAMBIGUOUS DESIGNS QUICKLY.
THESE DESIGNS ARE THEN TRANSLATED INTO
STAMPING DIES BY SKILLED CRAFTSMEN,
KNOWN AS DIEMAKERS.

NARRATION (VO) :

THESE STAMPING DIES ARE THEN MOUNTED IN
PRESSES WHERE SHEET METAL IS FED TO THEM
EITHER INDIVIDUALLY AS CUT BLANKS...,
OR CONTINUOUSLY FROM COILS.

NARRATION (VO) :

THERE, THE PRESS PROVIDES THE FORCE TO
CLOSE THE DIES WHERE THEY FORM THE SHEET
METAL INTO FINISHED PARTS.

--- TOUCH BLACK ---

NARRATION (VO) :

TO BETTER UNDERSTAND HOW STAMPING PRESS
DIES OPERATE, IT IS NECESSARY TO
UNDERSTAND THE SHEET METAL PROPERTIES

NEEDED TO PRODUCE ACCEPTABLE FINISHED PARTS.

SCENE 11.

SD11A, SME2694, 02:12:56:00-02:13:19:00
sheet metal being stamped on progressive die line

NARRATION (VO) :

THE MAIN MANUFACTURING REQUIREMENT FOR MOST SHEET METAL APPLICATIONS IS GOOD FORMABILITY. THIS IS THE SHEET METAL'S ABILITY TO DEFORM INTO INTRICATE SHAPES WITHOUT DEFECTS IN THE FINISHED PART.

SCENE 12.

SD12A, SME4393, 03:10:56:00-03:11:00:00
sheet metal being stamped
SD12B, CGS: Bending
Stretching
Drawing

NARRATION (VO) :

IN ALL SHEET METAL FORMING OPERATIONS, ONE OR MORE TYPES OF DEFORMATION ARE INVOLVED, INCLUDING:

BENDING,

STRETCHING,

AND OR DRAWING.

SCENE 13.

SD13A, SME2756, 02:23:06:00-02:23:20:00
part being stamped
SD13B, SME4393, 03:43:06:00-03:43:26:00
stamping operation
SD13C, CGS: Ductility of Metal
Die Design
Stamping Press
Press Speed
Lubrication
Sheet Metal Feeding
Mechanisms
Monitoring Systems/Controls
SD13D, SME4314B, 07:07:45:00-07:08:18:00
part being stamped

NARRATION (VO) :

PART SHAPE LARGELY DETERMINES THE RELATIVE SEVERITY OF THE SHEET METAL'S FORMABILITY, ESPECIALLY WHERE DRAWING AND STRETCHING OCCUR, BUT OTHER FACTORS ALSO INFLUENCE FORMABILITY. THOSE INCLUDE:

THE DUCTILITY OF THE METAL,

THE DIE DESIGN,

THE STAMPING PRESS,

PRESS SPEED,

LUBRICATION,

THE SHEET METAL FEEDING MECHANISMS,

AND MONITORING SYSTEMS AND CONTROLS WHICH SAFEGUARD AND SYNCHRONIZE THE OPERATION. BECAUSE OF THESE VARIOUS FACTORS, FORMABILITY DIFFERS FROM ONE PART OR OPERATION TO THE NEXT.

SCENE 14.

SD14A, SME2765, 02:23:24:00-02:23:33:00
c.u. failed part formed
SD14B, SME2765, 02:22:43:00-02:22:58:00
c.u. failed part formed
SD14C, SME2765, 02:07:16:00-02:07:30:00
c.u. failed part formed

NARRATION (VO) :

FORMING A PART WITH FORCE THAT EXCEEDS THE METAL'S ABILITY TO RESIST TEARING CAN RESULT IN FAILURE. FAILURE DURING FORMING CAN ALSO OCCUR DUE TO IMPURITIES OR VOIDS IN THE METAL.

--- TOUCH BLACK ---

SCENE 15.

SD15A, SME2693, 01:23:18:00-01:23:25:00
stamping operation
SD15B, SME2756, 02:18:34:00-02:18:43:00
c.u. foil being stamped
SD15C, SME4137, 08:26:18:00-08:26:28:00
thick stock being punched
SD15D, SME4137, 08:27:44:00-08:28:00:00
stamping operation

NARRATION (VO) :

SHEET METAL THICKNESS FOR STAMPINGS VARIES WIDELY, FROM FOILS AS THIN AS ONE-THOUSANDTH OF AN INCH, TO METAL UP TO ONE INCH THICK. MOST STAMPINGS, HOWEVER, ARE MADE FROM METAL RANGING FROM TWENTY-THOUSANDTHS TO EIGHTY-THOUSANDTHS OF AN INCH THICK.

--- TOUCH BLACK ---

SCENE 16.

SD16A, SME2694, 02:22:47:00-02:23:03:00
pan of multiple station ferrous stamping operation
SD16B, SME4428, 16:03:40:00-16:04:07:00
non-ferrous metal being stamped

NARRATION (VO) :

FERROUS..., AND NON-FERROUS METALS DIFFER IN THEIR ABILITY TO DEFORM, AS WELL AS IN TOOL DESIGN AND STAMPING PROCEDURES.

SCENE 17.

SD17A, SME2757, 01:02:45:00-01:03:00:00
automotive stamping operation using low
carbon steel

NARRATION (VO) :

THE MOST COMMON FERROUS SHEET METAL TYPE
USED IN STAMPING IS LOW-CARBON, OR MILD,
SHEET STEEL. IT IS USED MOSTLY IN THE
AUTOMOTIVE INDUSTRY AND HAS GOOD
FORMABILITY CHARACTERISTICS.

SCENE 18.

SD18A, SME2755, 01:06:59:00-01:07:06:00
aluminum being stamped
SD18B, SME2755, 01:06:22:00-01:06:32:00
aluminum being stamped

NARRATION (VO) :

ALUMINUM AND ITS ALLOYS ARE AMONG THE
MOST COMMONLY FABRICATED NON-FERROUS
METALS, AND ARE AVAILABLE IN VARIOUS
STRENGTH AND FORMABILITY COMBINATIONS.

SCENE 19.

continue previous shot
SD19A, SME2756, 02:20:39:00-02:20:55:00
copper being stamped
SD19B, CGS: Copper
 Brass
 Beryllium Copper
 Phosphor Bronze
 Cupronickel
 Nickel Silver

NARRATION (VO) :

OTHER NON-FERROUS METALS THAT CAN BE
FORMED INCLUDE:

COPPER AND ITS ALLOYS OF BRASS,
BERYLLIUM COPPER, PHOSPHOR BRONZE,
CUPRONICKEL AND NICKEL SILVER.

--- FADE TO BLACK ---

SCENE 20.

SD20A, CGS: Dies & Die Functions
white text, centered on background
FMP BKG, motion background

SCENE 21.

SD20A, SME4311, 03:40:16:00-03:40:34:00
zoom out, formed part placed in die,
punched and removed
SD20B, CGS: Die
SD20C, SME2695, 03:18:05:00-03:18:12:00
entire press tooling
SD20D, SME2695, 03:20:14:00-03:20:23:00
female side of die
SD20E, SME3339, 00:20:16:00-00:20:39:00
die half being machined

NARRATION (VO) :

THE TERM 'DIE' CAN BE CONFUSING SINCE IT
REPRESENTS TWO DIFFERENT THINGS. AS A
GENERIC TERM, IT REPRESENTS THE ENTIRE
PRESS TOOLING USED TO CUT AND FORM
METAL. HOWEVER, THE TERM 'DIE' CAN ALSO

REFER TO ONLY THE FEMALE HALF OF THE TOOL SET. DIES ARE MADE OF HIGH CARBON AND ALLOY STEELS. THE CARBON CONTENT IS NORMALLY IN THE RANGE OF 0.7 PERCENT TO 1.5 PERCENT. MANGANESE AND CHROMIUM ARE TYPICAL ALLOYS.

SCENE 22.

SD22A, ANI: 'male' punch mating with 'female' die, forming, punching hole in part

SD22B, CGS: Punch
Die

NARRATION (VO) :

THE 'MALE' PUNCH MATES WITH THE 'FEMALE' DIE AND, WORKING IN OPPOSITION TO EACH OTHER, THEY FORM SHAPES AND PUNCH HOLES IN SHEET METAL.

SCENE 23.

SD23A, CGS: Die Set

SD23B, **SME2761**, **04:10:04:00-04:10:17:00**
die set taken apart

SD23C, **SME2761**, **04:02:23:00-04:02:26:00**
small die set

SD23D, **SME2761**, **04:01:24:00-04:01:28:00**
small die set

SD23E, **SME2765**, **02:03:44:00-02:03:47:00**
large die set

SD23F, **SME4426**, **14:31:06:00-14:31:10:00**
large die set

NARRATION (VO) :

THE TERM 'DIE SET' REFERS TO THE UPPER AND LOWER DIE ASSEMBLIES, WHICH ARE ALSO CALLED PUNCH AND DIE HOLDERS, OR SHOES, AS WELL AS OTHER COMPONENTS. DIE SETS CAN TAKE MANY FORMS, SHAPES AND SIZES.

SCENE 24.

SD24A, **SME4426**, **14:25:05:00-14:25:42:00**
upper die half clamped to ram

SD24B, **SME4138**, **09:06:19:00-09:06:31:00**
lower die half clamped to bolster plate

SD24C, **SME4426**, **14:22:41:00-14:22:47:00**
die forced closed by press ram

NARRATION (VO) :

THE UPPER HALF OF THE DIE SET IS CLAMPED TO THE PRESS RAM, WHILE THE LOWER HALF IS SECURED TO THE BOLSTER PLATE ON THE PRESS BED. THE DIE HALVES ARE OPENED AND CLOSED BY MOVEMENT OF THE PRESS RAM.

SCENE 25.

SD25A, **SME2694**, **02:15:58:00-02:16:06:00**
matched bushings, pan to ball bearing bushings

SD25B, **SME4144**, **15:23:57:00-15:24:20:00**
zoom out, ball bearing bushings

NARRATION (VO) :

GUIDE PINS SLIDING IN MATCHED BUSHINGS...,
OR BALL BEARING BUSHINGS ALIGN THE UPPER

AND LOWER HALF OF THE DIE SET.

--- TOUCH BLACK ---

SCENE 26.

SD26A, SME4138, 09:10:57:00-09:11:14:00
stamping operation

SD26B, CGS: Cutting
Bending
Forming
Drawing
Squeezing

SD26C, SME2694, 02:10:00:00-02:10:05:00
cutting die operation

SD26D, SME4421, 12:40:53:00-12:41:03:00
forming die operation

NARRATION (VO) :

BASIC DIE OPERATIONS INCLUDE CUTTING,
BENDING,

FORMING,

DRAWING,

AND SQUEEZING.

THE TWO MOST COMMON TYPES OF DIES,

HOWEVER, ARE CUTTING DIES...,

AND FORMING DIES.

SCENE 27.

SD27A, CGS: Cutting

SD27B, SME3528, 02:13:50:00-02:14:00:00
cutting die operation

SD27C, SME3534, 10:04:36:00-10:04:44:00
cutting die operation

SD27D, SME4428, 16:01:39:00-16:01:49:00
cutting die operation

SD27E, CGS: Shearing
Blanking
Hole Punching
Trimming

NARRATION (VO) :

CUTTING IS THE MOST COMMON PRESSWORKING
OPERATION USING DIES. CUTTING OPERATIONS

INCLUDE SHEARING,

BLANKING,

HOLE PUNCHING,

AND TRIMMING

SCENE 28.

SD28A, CGS: Shearing

SD28B, SME2766, 04:02:05:00-04:02:20:00
stock being sheared

NARRATION (VO) :

SHEARING IS A PROCESS BY WHICH LARGE
SHEETS OF MATERIAL ARE CUT INTO SMALLER

SECTIONS. THESE PIECES ARE GENERALLY

USED IN LATER OPERATIONS.

SCENE 29.

SD29A, CGS: Blanking

SD29B, SME3534, 10:02:20:00-10:02:30:00
parts being blanked on press

SD29C, SME3534, 10:07:43:00-10:07:53:00
parts being blanked on press

SD29D, SME4427, 15:14:59:00-15:15:08:00
additional forming operation being

NARRATION (VO) :

BLANKING IS A FORM OF SHEARING THAT CUTS

SHEET METAL STOCK AROUND THE COMPLETE

PERIMETER OF A SHAPE TO FORM A WORKPIECE

performed on blank

BLANK. REFERENCE TO A BLANK IN STAMPING USUALLY IMPLIES THE NEED TO PERFORM SUBSEQUENT OPERATIONS TO THE WORKPIECE.

SCENE 30.

SD30A, CGS: Punching

SD30B, **SME2693**, **01:13:37:00-01:13:55:00**
part being punched

NARRATION (VO) :

PUNCHING IS THE CUTTING OF A SLUG FROM THE SHEET METAL STOCK TO PRODUCE A HOLE.

SCENE 31.

continue previous shot

SD31A, ANI: die, clearance between the punch and the die indicated

SD31B, **SME4428**, **16:22:37:00-16:22:50:00**
punching operation

SD31C, CGS: Material Type
Workpiece Thickness
Material Temper

NARRATION (VO) :

HOLE PUNCHING, AS WELL AS OTHER FORMS OF DIE CUTTING, REQUIRES SPECIFIC CLEARANCE BETWEEN THE PUNCH AND THE DIE. PROPER CLEARANCE IS A FUNCTION OF THE TYPE, THICKNESS AND TEMPER OF THE WORKPIECE MATERIAL.

SCENE 32.

SD32A, **SME4311**, **03:32:57:00-03:33:13:00**
zoom in, punching operation

SD32B, ANI: stock stressed between punch and die, stresses build up until fracture occurs

NARRATION (VO) :

DURING PUNCHING, THE STOCK IS STRESSED BETWEEN THE CUTTING EDGES OF THE PUNCH AND THE DIE. AS THE PUNCH PENETRATES THE MATERIAL, STRESSES BUILD UP UNTIL FRACTURE OCCURS.

SCENE 33.

SD33A, ANI: photomicrography of die-cut edge, arrow indicates burnished edge where the punch penetrated, then indicates the rough edge where fracture occurred

NARRATION (VO) :

CLOSE INSPECTION OF A DIE-CUT EDGE OF SHEET METAL STOCK REVEALS A BURNISHED EDGE WHERE THE PUNCH PENETRATED THE STOCK FOLLOWED BY A ROUGH EDGE WHERE FRACTURE OCCURRED.

SCENE 34.

SD34A, ANI: mild steel stock separated at one third thickness of stock

NARRATION (VO) :

MILD STEEL GENERALLY SEPARATES WHEN

SD34B, ANI: hard material separating at less than one third thickness

SD34C, ANI: soft metal requiring almost full penetration before separating

APPROXIMATELY ONE-THIRD OF THE STOCK THICKNESS HAS BEEN PENETRATED. HOWEVER, WHEN HARDER MATERIALS ARE DIE-CUT, PENETRATION BY THE PUNCH MAY BE LESS THAN ONE-THIRD THE MATERIAL THICKNESS, AND SOFTER MATERIALS MAY REQUIRE ALMOST FULL PUNCH PENETRATION BEFORE FRACTURE OCCURS.

SCENE 35.

SD35A, **SME2758**, **02:01:48:00-02:01:54:00**
forming operation on part

SD35B, CGS: Trimming

SD35C, **SME2758**, **02:05:35:00-02:05:46:00**
trimming operation on same part

NARRATION (VO) :

ONCE A PART HAS BEEN FORMED, A TRIMMING DIE IS UTILIZED TO REMOVE THE EXCESS SCRAP METAL FROM THE WORKPIECE.

SCENE 36.

SD36A, CGS: Forming

SD36B, **SME4427**, **15:02:06:00-15:02:15:00**
forming operation

SD36C, **SME4427**, **15:06:04:00-15:06:12:00**
forming operation

SD36D, **SME4137**, **08:11:33:00-08:11:40:00**
forming operation

SD36E, **SME4138**, **09:18:03:00-09:18:18:00**
forming operation

SD36F, CGS: Drawing

Bending

Flanging

Hemming

NARRATION (VO) :

FORMING IS A BROAD TERM FOR METALWORKING PROCESSES IN WHICH THE SHAPE OF A PUNCH AND DIE IS REPRODUCED DIRECTLY IN THE METAL. SOME COMMON FORMING OPERATIONS DONE WITH PRESS-MOUNTED DIES INCLUDE DRAWING, BENDING, FLANGING, AND HEMMING.

SCENE 37.

SD37A, CGS: Drawing

SD37B, **SME2765**, **02:20:50:00-02:20:59:00**
draw forming operation, dissolve to

SD37C, **SME2765**, **02:21:06:00-02:21:12:00**
part from draw forming operation

NARRATION (VO) :

DRAWING SHAPES A FLAT, PRECUT METAL BLANK BY FORCING IT INTO A DIE CAVITY WITH A PUNCH WITHOUT EXCESSIVE WRINKLING, THINNING OR FRACTURING OF THE METAL. VARIOUS COMPLEX FORMS MAY BE

PRODUCED BY DRAWING.

SCENE 38.

SD38A, SME4427, 15:21:39:00-15:22:00:00
shallow drawing operation
SD38B, SME4423, 13:49:42:00-15:49:52:00
deep drawing operation
SD38C, SME4427, 15:14:59:20-15:15:08:00
shallow drawing operation
SD38D, SME4423, 13:38:52:00-15:38:59:00
deep drawing operation

NARRATION (VO) :

DRAWING CAN BE SHALLOW...,

OR DEEP.

THE DEFINING FACTOR BETWEEN SHALLOW AND DEEP DRAWING IS THE DEPTH OF THE DRAW IN RELATION TO THE DIMENSION OF THE PART OPENING. A SHALLOW DRAW IS ONE WHERE THE DEPTH OF THE DRAW IS LESS THAN THE SMALLEST PART OPENING. WHILE WITH DEEP DRAWS, THE DRAW DEPTH IS LARGER THAN THE SMALLEST PART OPENING.

SCENE 39.

SD39A, SME2766, 05:03:38:00-05:03:44:00
small parts on finger
SD39B, SME2757, 01:21:49:00-01:22:00:00
large, automotive parts being drawn

NARRATION (VO) :

DRAWN PARTS MAY VARY IN SIZE FROM SMALL PARTS, UP TO AIRCRAFT AND AUTOMOTIVE PARTS LARGE ENOUGH TO REQUIRE MECHANICAL HANDLING EQUIPMENT.

SCENE 40.

SD40A, ANI, cross section of die, metal drawn into die
SD40B, SME2758, 02:04:46:00-02:05:00:00
c.u. pan of complex drawn part

NARRATION (VO) :

FOR PROPERLY DRAW-FORMED PARTS, THE FORCE EXERTED BY THE PUNCH MUST BE GREAT ENOUGH TO DRAW THE METAL OVER THE EDGE OF THE DIE OPENING AND INTO THE DIE. ADDITIONALLY, THE DRAWN METAL MUST HAVE A COMBINATION OF STRENGTH AND DUCTILITY, TO AVOID RUPTURE IN THE CRITICAL AREA WHERE THE METAL CONFORMS FROM THE PUNCH FACE TO THE PUNCH SIDES.

SCENE 41.

SD41A, SME2758, 02:08:23:00-02:08:39:00

pan of drawn part to buckled edges

NARRATION (VO) :

COMPRESSIVE FORCES ON THE METAL IN THE AREA BEYOND THE DIE'S EDGE WILL CAUSE THE METAL TO BUCKLE. IF THIS METAL WERE PULLED INTO THE DIE, BUCKLING WOULD INCREASE UNTIL THE METAL RUPTURED.

SCENE 42.

SD42A, ANI: cross section of die,

blankholder used in drawing operation

SD42B, SME4427, 15:33:26:00-15:33:39:00

part being drawn with large blankholder

SD42C, CGS: Blankholder

SD42D, SME4427, 15:12:28:00-15:12:41:00

large blankholder

SD42E, SME4427, 15:13:48:00-15:14:00:00

large blankholder

NARRATION (VO) :

TO PREVENT BUCKLING, THE BLANK MUST BE HELD TIGHTLY BY A BLANKHOLDER. ON MOST FORMING PRESSES, THE BLANKHOLDER IS AN OUTER RING THROUGH WHICH THE INNER RAM OR PUNCH PASSES. THE BLANKHOLDER HOLDS THE WORKPIECE AGAINST THE DRAW DIE TO CONTROL METAL FLOW AS THE PUNCH FORMS THE SHAPE.

SCENE 43.

continue previous shot

NARRATION (VO) :

IN PRACTICE, THE BLANKHOLDER MUST EXERT LESS PRESSURE AGAINST THE BLANK THAN THE PUNCH, SO METAL CAN FLOW INTO THE DIE; YET IT MUST EXERT ENOUGH PRESSURE TO PREVENT WRINKLING.

SCENE 44.

SD44A, SME2694, 02:06:15:00-02:06:23:00

blank being formed

SD44B, SME4427, 15:02:20:00-15:02:25:00

blank being formed

SD44C, CGS: Severity of the Draw Reduction
Metal Properties & Thickness
Die Lubrication

NARRATION (VO) :

FACTORS DETERMINING NECESSARY BLANKHOLDER PRESSURE VARY FROM PART TO PART, BUT INCLUDE THE SEVERITY OF THE DRAW REDUCTION, METAL PROPERTIES AND THICKNESS, DIE LUBRICATION AND OTHER

FACTORS.

SCENE 45.

SD45A, CGS: Bending

SD45B, **SME4314**, **06:07:54:00-06:08:18:00**
zoom out, bending operation on progressive die

NARRATION (VO) :

BENDING IS PERFORMED ON SHEET METAL TO GAIN RIGIDITY AND TO PRODUCE A PART OF DESIRED SHAPE. BENDING IS USUALLY DONE TO MAKE STRUCTURAL STAMPINGS SUCH AS BRACKETS, BRACES, AND SUPPORTS.

SCENE 46.

SD46A, CGS: Flanging

SD46B, **SME4427**, **15:25:06:00-15:25:35:00**
c.u., part edge being flanged

SD46C, **SME2764**, **01:15:25:00-01:15:30:00**
flange produced as part of the stamping process

SD46D, **SME2693**, **01:09:27:00-01:09:35:00**
flange produced as part of the stamping process

SD46E, ANI: straight flange

SD46F, ANI: curved flange

SD46G, CGS: Appearance
Part Rigidity
Edge Strengthening
Removing a Sheared Edge
Accurately Positioned
Fastening Surface

NARRATION (VO) :

FLANGING IS A FORMING OPERATION SIMILAR TO BENDING, EXCEPT THAT THE FLANGED EDGE IS SHORTER AND NARROWER COMPARED TO THE OVERALL PART SIZE. A FLANGE CAN BE BENT DOWN ALONG A STRAIGHT OR CURVED LINE, AND IS USED FOR APPEARANCE, PART RIGIDITY, EDGE STRENGTHENING, REMOVING A SHEARED EDGE, AND TO PROVIDE AN ACCURATELY POSITIONED FASTENING SURFACE.

SCENE 47.

SD47A, CGS: Hemming

SD47B, **SME2758**, **02:15:43:00-02:16:01:00**
c.u. hemmed edge of sheet metal part

NARRATION (VO) :

IN SHEET METAL FORMING, HEMMING IS UTILIZED PRIMARILY TO PROVIDE A SMOOTH ROUNDED FINISHED EDGE, AND TO ATTACH SHEET METAL PARTS TOGETHER.

SCENE 48.

continue previous shot

SD48A, CGS: Flat Hem

SD48B, ANI: flat hem

SD48C, CGS: Tear Drop Hem

SD48D, ANI: tear drop hem

SD48E, CGS: Open Hem

SD48F, ANI: open hem

NARRATION (VO) :

THERE ARE FOUR BASIC TYPES OF HEMS, INCLUDING:
THE FLAT HEM, WHICH CAN BE USED WITH MATERIALS HAVING HIGH DUCTILITY....,

SD48G, CGS: Rope Hem
SD48H, ANI: rope hem

THE TEAR DROP HEM, WHICH IS USED ON
MATERIALS LACKING THE DUCTILITY REQUIRED
TO FORM THE FLATTENED HEM WITHOUT
CRACKING...,
THE OPEN HEM...,
AND THE ROPE HEM WHICH ARE USED TO JOIN
SHEET METAL PARTS TOGETHER.

--- TOUCH BLACK ---

SCENE 49.

SD49A, **SME2755**, **01:24:37:00-01:24:52:00**
multiple operations carried out on part
using combination die
SD49B, **SME4314**, **06:06:10:00-06:06:32:00**
parts stamped using progressive die

NARRATION (VO) :

MULTIPLE OPERATIONS MAY BE CARRIED OUT
ON SHEET METAL STOCK EITHER AT A SINGLE
DIE STATION...,
OR AT MULTIPLE STATIONS WITHIN A SINGLE
STROKE OF THE PRESS.

SCENE 50.

SD50A, **SME2760**, **03:08:33:00-03:08:50:00**
single station stamping operation
SD50B, CGS: Compound Dies
 Combination Dies

NARRATION (VO) :

DIES USED IN SINGLE-STATION OPERATIONS
CAN BE EITHER COMPOUND DIES,
OR COMBINATION DIES.

SCENE 51.

SD51A, **SME4314**, **07:09:06:00-07:09:23:00**
compound die operation, edit at multiple
points

NARRATION (VO) :

COMPOUND DIES ARE PRESS TOOLS IN WHICH
ONLY CUTTING OPERATIONS ARE DONE,
USUALLY BLANKING AND HOLE PUNCHING.

SCENE 52.

SD52A, **SME4421**, **12:40:55:00-12:41:17:00**
combination die operation

NARRATION (VO) :

COMBINATION DIES ARE PRESS TOOLS IN
WHICH A CUTTING OPERATION, USUALLY
BLANKING, IS COMBINED WITH SHAPING OR
FORMING OPERATIONS.

SCENE 53.

SD53A, SME2694, 02:14:25:00-02:14:42:00
pan of multiple station stamping
operation, ending with part being cut off
SD53B, SME4428, 16:02:50:00-16:03:13:00
transfer line stamping operation

NARRATION (VO) :

MULTIPLE-STATION OPERATIONS ARE DONE
WITH DIES THAT HAVE SEVERAL STATIONS.
EACH STATION SIMULTANEOUSLY PERFORMS A
SINGLE STEP IN A SERIES OF OPERATIONS
NEEDED TO COMPLETE A PART. FINISHED
WORKPIECES ARE DISCHARGED WITH EACH
STROKE.

SCENE 54.

SD54A, SME4138, 09:10:59:00-09:11:13:00
progressive die stamping operation
SD54B, SME4392, 01:06:08:00-01:06:20:00
pan, transfer die stamping operation

NARRATION (VO) :

MULTIPLE-STATION OPERATIONS CAN BE
PERFORMED USING EITHER PROGRESSIVE
DIES...,
OR TRANSFER DIES.

SCENE 55.

SD55A, SME4138, 09:28:47:00-09:29:15:00
pan of progressive die stamping operation,
from coiled sheet metal to final cut off

NARRATION (VO) :

IN PROGRESSIVE DIE OPERATIONS, PARTS ARE
MADE FROM CONTINUOUS COIL STOCK, AND
REMAIN CONNECTED TO THE STOCK BY A
CARRIER STRIP DURING EACH SUCCESSIVE
OPERATION UNTIL THE FINAL CUTOFF AND
DISCHARGE FROM THE DIE.

SCENE 56.

SD56A, SME4137, 08:04:38:00-08:05:11:00
wide, transfer stamping operation
producing parts
SD56B, SME4137, 08:06:52:00-08:07:05:00
transfer stamping operation

NARRATION (VO) :

IN TRANSFER DIE OPERATIONS, PARTS ARE
BLANKED BEFORE OR AT THE BEGINNING OF
THE SEQUENTIAL OPERATIONS. MECHANICAL
TRANSFER DEVICES GRIP AND MOVE THE
INDIVIDUAL WORKPIECES FROM DIE STATION
TO DIE STATION WITHIN A SINGLE DIE TO

COMPLETE A PROGRESSION OF OPERATIONS.

SCENE 57.

SD57A, SME2757, 01:01:51:00-01:02:08:00
tandem line producing parts
SD57B, SME2757, 01:16:43:00-01:16:53:00
robots gripping parts, moving
SD57C, SME2758, 02:14:44:00-02:15:02:00
zoom out of presses stamping

NARRATION (VO) :

WITH LARGE WORKPIECES, A TANDEM PRESS
LINE MAY BE UTILIZED. PARTS ARE
TRANSFERRED BY GRIPPING DEVICES FROM
PRESS TO PRESS, INSTEAD OF WITHIN A
SINGLE DIE. EACH PRESS WITHIN THE TANDEM
LINE HOLDS ITS OWN TOOLING, AND PERFORMS
SPECIFIC OPERATIONS TO FORM, TRIM, AND
PIERCE THE PART.

--- FADE TO BLACK ---

SCENE 58.

SD58A, CGS: Die Lubrication
white text, centered on background
FMP BKG, motion background

SCENE 59.

SD59A, SME4427, 15:01:28:00-15:01:46:00
stamping operation
SD59B, SME2765, 02:20:21:00-02:20:30:00
stamping operation, pan to lubrication

NARRATION (VO) :

FRICITION IS INHERENT IN DIE CUTTING AND
FORMING PROCESSES. FORCES APPLIED TO
CUTTING AND FORMING TOOLS ARE
TRANSFERRED TO THE SHEET METAL BY DIRECT
CONTACT. FOR THIS REASON, LUBRICATION IS
VITAL FOR SUCCESSFUL SHEET METAL
FORMING.

SCENE 60.

SD60A, SME2694, 02:02:36:00-02:02:44:00
c.u. lubricant being used in operation
SD60B, SME2694, 02:19:26:00-02:19:36:00
c.u. lubricant
SD60C, SME4392, 01:27:37:00-01:27:54:00
lubricant used to perform deep draw
operation

NARRATION (VO) :

A LUBRICANT'S MAIN FUNCTION IS TO
MINIMIZE SURFACE CONTACT BETWEEN THE
TOOLING AND THE WORKPIECE. AS A RESULT,
WORKPIECE SURFACE QUALITY IS DIRECTLY

RELATED TO THE PROPERTIES AND BEHAVIOR
OF LUBRICANTS.

SCENE 61.

SD61A, SME4423, 13:47:26:00-13:47:49:00
zoom out, lubrication manually applied,
drawing operation

NARRATION (VO) :

IN ADDITION TO PROVIDING A BOUNDARY
BETWEEN DIE AND WORKPIECE, PROPER
LUBRICATION WILL COOL BOTH COMPONENTS TO
PREVENT METAL TO METAL ADHESION OR
WELDING, AND CUSHION THE DIE DURING THE
DRAW.

SCENE 62.

SD62A, SME4144, 15:17:46:00-15:18:20:00
zoom out, lubrication of sheet metal in
progressive die operation
SD62B, CGS: Controlled Friction
Reduced Force
Reduced Power Requirements
Reduced Tooling Stresses
Extends Tooling Life
Improves Product Quality

NARRATION (VO) :

EFFECTIVE LUBRICATION RESULTS IN
CONTROLLED FRICTION, REDUCED FORCE,
POWER REQUIREMENTS, AND TOOLING
STRESSES. PROPER LUBRICATION ALSO
EXTENDS TOOLING LIFE, AND IMPROVES
PRODUCT QUALITY BY ELIMINATING SURFACE
DAMAGE.

SCENE 63.

SD63A, SME4003, 02:02:52:00-02:03:08:00
lubrication of part
SD63B, CGS: Type of Operations Performed
Tooling Design & Materials
Metal to be Formed
Press Speed
Lubricant Application Method

NARRATION (VO) :

CHOOSING THE PROPER LUBRICANT REQUIRES
CAREFUL CONSIDERATION REGARDING THE TYPE
OF OPERATIONS PERFORMED, TOOLING DESIGN
AND MATERIALS, THE METAL TO BE FORMED,
PRESS SPEED, AND THE LUBRICANT
APPLICATION METHOD.

SCENE 64.

SD64A, SME2694, 02:20:00:00-02:20:10:00
light oil lubrication of part
SD64B, SME2695, 03:09:27:00-03:09:36:00
heavy drawing compound used in stamping
operation
SD64C, CGS: Oil-Based

NARRATION (VO) :

LUBRICANTS FOR STAMPING RANGE FROM LIGHT
MINERAL OILS, TO HEAVY DRAWING

Water Soluble
Synthetic

COMPOUNDS. THESE LUBRICANTS CAN BE OIL-
BASED,
WATER SOLUBLE,
OR SYNTHETIC.

SCENE 65.

SD65A, SME4428, 16:12:57:00-16:13:18:00
zoom in, lubrication of sheet metal in
progressive die operation

NARRATION (VO) :

THE OBJECTIVE IN APPLYING THESE
LUBRICANTS IS TO APPLY THE CORRECT TYPE
WHERE NEEDED, AT THE RIGHT TIME, AND IN
THE PROPER AMOUNT.

SCENE 66.

SD66A, SME4427, 15:18:39:00-15:19:03:00
sheet stock being lubricated
SD66B, CGS: Manual
Drip
Roller
Spraying
Flooding

NARRATION (VO) :

THE FIVE PRIMARY METHODS USED FOR
APPLYING DIE LUBRICANTS INCLUDE:
MANUAL,
DRIP,
ROLLER,
AND SPRAYING.
FLOODING.

SCENE 67.

SD67A, SME2694, 02:03:04:00-02:03:16:00
manual roller application of lubricant
SD67B, SME2764, 01:05:06:00-01:05:15:00
manual brush application of excessive
lubricant

NARRATION (VO) :

THE MOST BASIC LUBRICANT APPLICATION IS
DONE BY HAND, WITH A ROLLER, BRUSH, SWAB
OR SPONGE. MANUAL METHODS DO NOT REQUIRE
EXPENSIVE EQUIPMENT, BUT CAN BE
UNECONOMICAL BECAUSE OF WASTED
LUBRICANT, POOR UNIFORMITY AND EXCESSIVE
LABOR COSTS.

SCENE 68.

SD68A, SME2755, 01:24:55:00-01:25:15:00
drip application of lubricant

NARRATION (VO) :

DRIP APPLICATION SIMPLY ALLOWS THE

LUBRICANT TO DRIP CONTINUOUSLY ON THE STOCK STRIP. IT CAN BE USED FOR SMALL PARTS BEING BLANKED OR FORMED WITH LIGHT-BODIED, EASY-FLOWING LUBRICANTS.

SCENE 69.

SD69A, SME4314, 07:09:52:00-07:10:22:00

roller coating of lubrication

SD69B, CGS: Unpowered

Plain

Powered

SD69C, SME4428, 16:27:58:00-16:28:23:00

zoom out, roller coating of lubrication

NARRATION (VO) :

ROLLER COATING OF LUBRICATION IS WIDELY USED. THERE ARE THREE TYPES OF ROLLER COATERS:

UNPOWERED,

PLAIN, WHICH IS UNPOWERED WITH A RECIRCULATING SYSTEM,

AND POWERED.

THE PREFERRED POSITION FOR A ROLLER COATER IS BETWEEN THE STOCK FEEDING EQUIPMENT AND THE PRESS.

SCENE 70.

SD70A, SME4138, 09:18:00:00-09:18:15:00

zoom out, airspraying application of lubricant

SD70B, SME2694, 02:19:42:00-02:19:55:00

alternate shot, airspraying application of lubricant

SD70C, CGS: Airspray

Airless Spraying

Electrostatic

NARRATION (VO) :

SPRAYING SYSTEMS FOR APPLYING LUBRICANT INCLUDE AIRSPRAY, AIRLESS SPRAYING, AND ELECTROSTATIC.

SCENE 71.

SD71A, SME3468, 04:01:10:00-04:01:41:00

wide, flood lubrication system used to coat round blanks

SD71B, SME3468, 04:01:50:00-04:02:11:00

zoom out, flood lubrication system used to coat round blanks

NARRATION (VO) :

THE FLOOD LUBRICATION SYSTEM CONTINUOUSLY RECIRCULATES AND FILTERS A LUBRICANT, ALLOWING A HEAVY FLOW VOLUME TO BE USED WHEN NECESSARY, WITHOUT WASTE.

SCENE 72.

SD72A, SME3210, 11:02:42:00-11:03:04:00

NARRATION (VO) :

washing of stamped parts
SD72B, SME4393, 03:19:12:00-03:19:25:00
projection welding of bolts into stamped
fabrication

AS IMPORTANT AS LUBRICANT APPLICATION
IS, REMOVING THE LUBRICANT AFTER THE
PART IS STAMPED IS JUST AS IMPORTANT TO
FACILITATE FURTHER PROCESSING SUCH AS
WELDING AND FINISHING.

--- FADE TO BLACK ---

SCENE 73.
SD73A, CGS: Stamping Analysis
white text, centered on background
FMP BKG, motion background

SCENE 74.
SD74A, SME4003, 02:02:20:00-02:02:27:00
technician working on die
SD74B, SME4426, 14:07:51:00-14:07:58:00
technicians building die
SD74C, SME4003, 02:14:21:00-14:14:52:00
technician working on die

NARRATION (VO) :

DIE MAKING IS AS MUCH AN ART AS IT IS A
SCIENCE, AND REQUIRES A GREAT DEAL OF
EXPERIENCE AND EXPERTISE TO CONSTRUCT A
DIE THAT WILL MANUFACTURE AN ACCEPTABLE
PART.

SCENE 75.
continue previous shot
SD75A, CGS: Metal Flow
Friction at the Tool/Workpiece
Interface
Behavior Properties of the
Stamped Material
SD75B, SME4137, 08:31:30:00-08:31:55:00
part being stamped

NARRATION (VO) :

FACTORS SUCH AS:
METAL FLOW,
FRICTION AT THE TOOL/WORKPIECE
INTERFACE,
AND THE BEHAVIOR PROPERTIES OF THE
STAMPED MATERIAL MAKE IT DIFFICULT TO
PREDICT THE FINAL SHAPE THAT A DIE WILL
PRODUCE.

SCENE 76.
SD76A, SME2765, 02:28:04:00-02:28:22:00
technicians looking at formed part with
circle grid
SD76B, CGS: Circle Grid Analysis/CGA

NARRATION (VO) :

ONE ANALYTICAL TOOL USED BY DIE MAKERS
TO HELP ASSURE SHEET METAL PART DESIGN

FORMABILITY IS CALLED CIRCLE GRID ANALYSIS, OR 'CGA'. THIS TECHNIQUE PERMITS MEASURING THE TYPE AND SEVERITY OF DEFORMATION THAT OCCURS AT VARIOUS POINTS ON A STAMPED PART.

SCENE 77.

SD77A, SME2765, 02:12:26:00-02:12:42:00

grid etched into sheet metal stock

SD77B, SME2765, 02:18:32:00-02:18:41:00

stock stamped

SD77C, SME2765, 02:19:14:00-02:19:23:00

c.u. deformed grid

NARRATION (VO) :

FIRST A GRID, CONSISTING OF A PATTERN OF SMALL CIRCLES IS ETCHED ON THE SURFACE OF THE BLANK PRIOR TO FORMING. THIS GRID DEFORMS WITH THE BLANK ALLOWING POINT-TO-POINT CALCULATIONS OF THE DEFORMATION THAT OCCURRED DURING THE STAMPING OPERATION.

SCENE 78.

SD78A, SME2765, 02:24:28:00-02:24:44:00

c.u. deformed grid of part being inspected

NARRATION (VO) :

ANALYZING THE STAMPED GRID PATTERN SUGGESTS THE LOCATION AND TYPE OF REWORK THAT MUST BE PERFORMED ON THE DIES TO PRODUCE EASILY MANUFACTURED PARTS.

SCENE 79.

SD79A, SME2765, 02:13:53:00-02:14:05:00

pull back, stock being etched

SD79B, SME2766, 03:01:16:00-03:01:26:00

c.u. deformed grid

SD79C, SME2765, 02:15:24:00-02:15:29:00

stock being etched

NARRATION (VO) :

ONCE CHANGES ARE MADE, THE CIRCLE GRID ANALYSIS PROCESS BEGINS AGAIN. BY OBSERVING THE RESULTING CHANGES IN METAL DEFORMATION, THE TOOLROOM TECHNICIANS CAN IDENTIFY THE CORRECTIONS NEEDED FOR FOLLOWING TRYOUTS. THIS PROCESS CONTINUES UNTIL AN ACCEPTABLE PART IS MADE.

SCENE 80.

SD80A, SME4002, 01:43:12:00-01:43:28:00
computer screen with formed part,
indication of parts formability
SD80B, SME4427, 15:55:04:00-15:55:37:00
computer screen with sheet metal cycling
through drawing operation forces
SD80C, SME4427, 15:55:56:00-15:56:00:00
long still of final formed part
SD80D, SME4140, 08:12:18:00-08:12:36:00
computer screen with finite element
modeling being used to prove out formed
part
SD80E, SME4002, 01:45:02:00-01:45:19:00
computer screen with formed part,
indication of parts formability

NARRATION (VO) :

COMPUTER SOFTWARE PROGRAMS ARE AVAILABLE
THAT CAN ASSURE THAT PROPOSED STAMPING
DESIGNS CAN BE MANUFACTURED WITH
CERTAINTY, WITH THE OBJECTIVE OF
MINIMIZING THE LENGTHY FINE-TUNING
PROCESS OF DIE MAKING. ANALYTICAL TOOLS
SUCH AS FINITE ELEMENT MODELING, OR FEM,
ARE ALSO USED ESPECIALLY FOR
FACILITATING DEEP DRAW PROGRESSIVE
DESIGN WITH MINIMUM TRIAL AND ERROR
SITUATIONS.

--- FADE TO BLACK ---

SCENE 81.

FMP RVW, CGS: Review
white text, centered on background
FMP BKG, motion background

NARRATION (VO) :

LET'S REVIEW THE MATERIAL CONTAINED IN
THIS PROGRAM.

SCENE 82.

SD07A, SME4427, 15:14:59:00-15:15:06:00
c.u. stamping operation, emphasis on die
set
SD07B, SME4427, 15:19:14:00-15:19:30:00
c.u. stamping operation, emphasis on die
set

NARRATION (VO) :

STAMPING DIES ARE THE TOOLS, MOUNTED IN
PRESSES, THAT CUT AND SHAPE SHEET METAL
PARTS.

SCENE 83.

SD10B, SME4427, 15:44:52:00-15:44:02:00
sheet metal being stamped

NARRATION (VO) :

THE PROPERTIES OF SHEET METAL INFLUENCE
THE WAY STAMPING PRESS DIES WORK.

SCENE 84.

SD11A, SME2694, 02:12:56:00-02:13:19:00
sheet metal being stamped on progressive
die line

NARRATION (VO) :

GOOD FORMABILITY IS AN ESSENTIAL
PROPERTY OF SHEET METAL AND MEANS IT HAS

THE CAPABILITY OF BEING EXTENSIVELY
DEFORMED INTO INTRICATE SHAPES WITHOUT
DEFECTS IN THE FINISHED PART.

SCENE 85.

SD15B, SME2756, 02:18:34:00-02:18:43:00
c.u. foil being stamped

SD15C, SME4137, 08:26:18:00-08:26:28:00
thick stock being punched

SD15D, SME4137, 08:27:44:00-08:28:00:00
stamping operation

NARRATION (VO) :

SHEET METAL USED FOR STAMPING VARIES IN
THICKNESS FROM THIN FOIL...,
TO MATERIAL UP TO ONE INCH THICK. THE
MAJORITY OF STAMPINGS ARE MADE FROM
METAL WITH THICKNESS FROM TWENTY
THOUSANDTHS TO EIGHTY THOUSANDTHS OF AN
INCH IN LOW-CARBON SHEET STEEL.

SCENE 86.

SD20A, SME4311, 03:40:16:00-03:40:34:00
zoom out, formed part placed in die,
punched and removed

SD20B, CGS: Die

SD20C, SME2695, 03:18:05:00-03:18:12:00
entire press tooling

SD20D, SME2695, 03:20:14:00-03:20:23:00
female side of die

NARRATION (VO) :

THE TERM 'DIE' MEANS THE ENTIRE PRESS
TOOLING USED TO CUT AND FORM METAL, YET
ALSO REFERS TO THE FEMALE HALF OF THE
TOOLING THAT MATES WITH THE MALE PUNCH.

SCENE 87.

SD23A, CGS: Die Set

SD23B, SME2761, 04:10:04:00-04:10:17:00
die set taken apart

SD23C, SME2761, 04:02:23:00-04:02:26:00
small die set

SD23D, SME2761, 04:01:24:00-04:01:28:00
small die set

SD23E, SME2765, 02:03:44:00-02:03:47:00
large die set

SD23F, SME4426, 14:31:06:00-14:31:10:00
large die set

NARRATION (VO) :

THE TERM 'DIE SET' REFERS TO THE UPPER
AND LOWER DIE ASSEMBLIES, WHICH ARE ALSO
CALLED PUNCH AND DIE HOLDERS, OR SHOES,
AS WELL AS OTHER COMPONENTS. DIE SETS
CAN TAKE MANY FORMS, SHAPES AND SIZES.

SCENE 88.

SD26C, SME2694, 02:10:00:00-02:10:05:00
cutting die operation

SD26D, SME4421, 12:40:53:00-12:41:03:00
forming die operation

NARRATION (VO) :

THE TWO MOST COMMON TYPES OF DIES ARE
CUTTING DIES...,
AND FORMING DIES.

SCENE 89.

SD27A, CGS: Cutting
SD27B, **SME3528**, **02:13:50:00-02:14:00:00**
cutting die operation
SD28A, CGS: Shearing
SD28B, **SME2766**, **04:02:05:00-04:02:20:00**
stock being sheared
SD29A, CGS: Blanking
SD29B, **SME3534**, **10:02:20:00-10:02:30:00**
parts being blanked on press
SD29C, **SME3534**, **10:07:43:00-10:07:53:00**
parts being blanked on press
SD30A, CGS: Punching
SD30B, **SME2693**, **01:13:37:00-01:13:55:00**
part being punched
SD35B, CGS: Trimming
SD35C, **SME2758**, **02:05:35:00-02:05:46:00**
trimming operation on same part
SD47A, CGS: Hemming
SD47B, **SME2758**, **02:15:43:00-02:16:01:00**
c.u. hemmed edge of sheet metal part

NARRATION (VO) :

CUTTING OPERATIONS INCLUDES:

SHEARING,

BLANKING,

HOLE PUNCHING,

AND TRIMMING.

SCENE 90.

SD36A, CGS: Forming
SD36B, **SME4427**, **15:02:06:00-15:02:15:00**
forming operation
SD37A, CGS: Drawing
SD37B, **SME2765**, **02:20:50:00-02:20:59:00**
draw forming operation
SD45A, CGS: Bending
SD45B, **SME4314**, **06:07:54:00-06:08:18:00**
zoom out, bending operation on progressive
die
SD46A, CGS: Flanging
SD46B, **SME4427**, **15:25:06:00-15:25:35:00**
c.u., part edge being flanged

NARRATION (VO) :

COMMON FORMING OPERATIONS INCLUDE

DRAWING,

BENDING,

FLANGING,

AND HEMMING.

SCENE 91.

SD49A, **SME2755**, **01:24:37:00-01:24:52:00**
multiple operations carried out on part
using combination die
SD49B, **SME4314**, **06:06:10:00-06:06:32:00**
parts stamped using progressive die

NARRATION (VO) :

MULTIPLE OPERATIONS MAY BE CARRIED OUT

ON SHEET METAL STOCK EITHER AT A SINGLE

DIE STATION...,

OR AT MULTIPLE STATIONS WITHIN A SINGLE

STROKE OF THE PRESS.

SCENE 92.

SD51A, **SME4314**, **07:09:06:00-07:09:23:00**
compound die operation, edit at multiple
points
SD52A, **SME4421**, **12:40:55:00-12:41:17:00**

NARRATION (VO) :

DIES USED IN SINGLE-STATION OPERATIONS

combination die operation

CAN BE EITHER COMPOUND DIES...,
OR COMBINATION DIES.

SCENE 93.

SD54A, SME4138, 09:10:59:00-09:11:13:00
progressive die stamping operation
SD54B, SME4392, 01:06:08:00-01:06:20:00
pan, transfer die stamping operation
SD57A, SME2757, 01:01:51:00-01:02:08:00
tandem line producing parts
SD57B, SME2757, 01:16:43:00-01:16:53:00
robots griping parts, moving

NARRATION (VO) :

MULTIPLE-STATION OPERATIONS ARE
PERFORMED WITH EITHER PROGRESSIVE
DIES...,
OR TRANSFER DIES.

LARGE PARTS CAN BE TRANSFERRED BETWEEN
TANDEM LINE PRESSES, EACH OF WHICH
PERFORMS DIFFERENT OPERATIONS ON THE
WORKPIECE.

SCENE 94.

SD60A, SME2694, 02:02:36:00-02:02:44:00
c.u. lubricant being used in operation
SD60B, SME2694, 02:19:26:00-02:19:36:00
c.u. lubricant
SD60C, SME4392, 01:27:37:00-01:27:54:00
lubricant used to perform deep draw
operation

NARRATION (VO) :

A LUBRICANT'S MAIN FUNCTION IN SHEET
METAL OPERATIONS IS TO MINIMIZE SURFACE
CONTACT BETWEEN THE TOOLING AND THE
WORKPIECE.

SCENE 95.

SD67A, SME2694, 02:03:04:00-02:03:16:00
manual roller application of lubricant
SD68A, SME2755, 01:24:55:00-01:25:15:00
drip application of lubricant
SD69C, SME4428, 16:27:58:00-16:28:23:00
zoom out, roller coating of lubrication
SD70A, SME4138, 09:18:00:00-09:18:15:00
zoom out, airspraying application of
lubricant
SD71B, SME3468, 04:01:50:00-04:02:11:00
zoom out, flood lubrication system used to
coat round blanks

NARRATION (VO) :

METHODS OF APPLYING LUBRICANT INCLUDE
MANUAL...,
DRIP...,
ROLLER...,
SPRAYING...,
AND FLOODING.

SCENE 96.

SD78A, SME2765, 02:24:28:00-02:24:44:00
c.u. deformed grid of part being inspected

NARRATION (VO) :

DEFORMATION OF THE ETCHED GRID ON THE
SURFACE OF A BLANK ALLOWS POINT-TO-POINT
CALCULATIONS OF THE DEFORMATION THAT

OCCURRED DURING STAMPING.

SCENE 97.

SD80A, SME4002, 01:43:12:00-01:43:28:00

computer screen with formed part,
indication of parts formability

SD80B, SME4427, 15:55:04:00-15:55:37:00

computer screen with sheet metal cycling
through drawing operation forces

SD80C, SME4427, 15:55:56:00-15:56:00:00

long still of final formed part

NARRATION (VO) :

COMPUTER SOFTWARE PROGRAMS ARE AVAILABLE
TO MINIMIZE THE LENGTHY FINE-TUNING
PROCESS OF DIE MAKING.

--- FADE TO BLACK ---

SCENE 98.

continue music, up and under

SD CRX, CGS, ROLL: credits

white text, fade up mid-screen

FMP EXM, extended motion background

Produced By:

Society of Manufacturing Engineers

Executive Producer:

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Producer/Director:

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Saraboo Productions

Written By:

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Richard G. Green

Equipment Access Provided By:

American Tooling Center, Inc.

CIGNYS

Diversified Tooling Group

K & K Stamping Company

McLaughlin Body Company

Rockford Toolcraft, Inc.

Superior CAM, Inc.

Talan Products Inc.

Graphics:

Jerome T. Cook

Dennis Summers,
Quantum Dance Works

Production Assistance:
Lance Rosol

Video Editing:
Jerome T. Cook

SCENE 99.
continue motion background
FMP DIS, CGS: disclaimer
white text, centered on background

Some machinery in this program had
safety equipment removed to allow better
recording of certain processes.
Always read the safety information
provided in the manufacturers' manual
before machine operation.

SCENE 100.
FMP SME, SME logo open, with music