FUNDAMENTALS OF TOOL DESIGN

Rapid Tooling Design

SCENE 1.
RT06A, FTD56, 07:22:27:00-07:22:53:00
injection molding using rapid tooled mold
RT06B, CGS: Cost Reduction
Efficiency Improvement
Labor Reduction

NARRATION (VO):

THE KEY ADVANTAGE OF RAPID TOOLING IS A REDUCTION IN THE TIME TO PRODUCE A MOLD FOR PARTS PRODUCTION. OTHER ADVANTAGES, SUCH AS COST REDUCTION, EFFICIENCY IMPROVEMENT AND LABOR REDUCTION MAY ALSO BE ACHIEVED.

SCENE 2.
RT07A, FTD60, 12:02:05:00-12:02:30:00
rapid tooling being produced
RT07B, FTD10, 09:20:50:00-09:20:59:00
zoom out, high speed machining of mold
RT07C, FMP828, 06:07:21:00-06:07:32:00
pulling part from rtv process
RT07D, FMP916, 11:04:04:00-11:04:17:00
injection molding operation
RT07E, FMP454, 22:09:59:00-22:10:22:00
investment casting operation
RT07F, FTD29, 09:17:58:00-09:18:12:00
zoom out, progressive stamping operation

NARRATION (VO):

RAPID TOOLING HAS COME TO DESCRIBE ANY MOLD MAKING PROCESS THAT IS PERFORMED QUICKLY. IT INCLUDES TOOL MAKING APPROACHES THAT APPLY ADDITIVE...,
SUBTRACTIVE...,
AND PATTERN-BASED PROCESSES--ALONE OR IN COMBINATION--FOR A VARIETY OF APPLICATIONS RANGING FROM INJECTION MOLDING...,
TO CASTING OPERATIONS...,
AND SHEET METAL STAMPING.

SCENE 3.
RT08A, FTD68, 01:03:23:00-01:03:47:00
zoom in, rtv molding
RT08B, FTD56, 07:41:05:00-07:41:21:00
zoom out, dmls process
RT08C, FTD56, 07:20:33:00-07:20:45:00
injection mold, part ejected
RT08D, FTD60, 12:15:42:00-12:16:12:00
dmls process

NARRATION (VO):

IN THIS BROAD CONTEXT, RAPID TOOLING IS FAR TOO EXTENSIVE TO EXPLORE ADEQUATELY. FOR THAT REASON, THIS PROGRAM WILL FOCUS ON MOLD MAKING THAT EMPLOYS ADDITIVE RAPID PROTOTYPING PROCESSES TO PRODUCE

PLASTIC PARTS THAT ARE DESIGNED FOR INJECTION MOLDING.

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SCENE 4.
RT09A, FMP829, 07:06:10:00-07:06:38:00
molding of parts using rtv mold
RT09B, CGS: Indirect Tooling
Direct Tooling

NARRATION (VO):

RAPID TOOLING CAN BE DEPLOYED IN TWO FORMS:

INDIRECT TOOLING,

AND DIRECT TOOLING.

SCENE 5.
RT10A, FTD69, 03:12:10:00-03:12:25:00
zoom in, pattern pulled from rtv mold
RT10B, CGS: Indirect Tooling

NARRATION (VO):

INDIRECT TOOLING INCORPORATES PATTERN-BASED METHODS WHERE A TOOL IS CAST FROM A RAPID PROTOTYPE THAT DEPICTS THE PART TO BE MOLDED.

SCENE 6.
RT11A, FTD64, 16:01:42:00-16:01:59:00
zoom out, mold having direct tooling elements
RT11B, FTD63, 15:06:02:00-15:06:17:00
zoom in, dmls process
RT11C, CGS: Direct Tooling
RT11D, FTD60, 12:08:50:00-12:09:20:00
dmls process

NARRATION (VO):

DIRECT TOOLING IS A METHOD WHERE THE MOLD, INSERTS OR COMPONENTS ARE MADE DIRECTLY FROM A RAPID PROTOTYPING MACHINE.

SCENE 7.
continue previous shot
RT12A, FTD68, 01:52:13:00-01:52:22:00
wiper action in stereolithography operation, dissolve to next image
RT12B, FTD68, 01:52:29:00-01:53:05:00
zoom out, stereolithography operation

NARRATION (VO):

TO UNDERSTAND RAPID TOOLING AND LEVERAGE ITS ADVANTAGES, THERE MUST BE AN APPRECIATION FOR THE UNDERLYING TECHNOLOGY, RAPID PROTOTYPING. ALSO CALLED ADDITIVE FABRICATION, ADDITIVE MANUFACTURING, AND FREEFORM FABRICATION, RAPID PROTOTYPING GROWS PHYSICAL OBJECTS—DIRECT FROM ‘3D’ CAD DATA—BY

BONDING LAYERS OF MATERIAL.

SCENE 8.
RT13A, FTD60, 12:01:04:00-12:01:29:00
zoom in, laser sintering operation
RT13B, FMP826, 02:11:18:00-02:11:34:00
zoom in, laser sintering operation
RT13C, FTD59, 11:29:29:00-11:30:11:00
laser sintering operation

NARRATION (VO):

THE ADDITIVE NATURE OF THE PROCESS ALLOWS INTRICATE DETAILS AND COMPLEX SHAPES TO BE MANUFACTURED WITH LITTLE EFFORT AND NO IMPACT ON TIME OR COST. ALSO, MUCH OF THE PROCESS IS COMPLETED WITHOUT DIRECT LABOR OR A MACHINE OPERATOR IN ATTENDANCE.

SCENE 9.
RT14A, FTD59, 11:23:49:00-11:24:10:00
laser sintering operation
RT14B, FTD59, 11:50:21:00-11:50:33:00
zoom out, laser sintered part

NARRATION (VO):

THIS DISTINCTION FROM TRADITIONAL MACHINING AND MANUFACTURING PROCESSES PROMOTES THE USE OF RAPID PROTOTYPING-BASED TOOLING WHEN ELEMENTS OF A MOLD ARE INTRICATE AND HIGHLY DETAILED.

SCENE 10.
RT15A, FMP825, 01:21:15:00-01:21:50:00
zoom out, 3d systems stereolithography operation
RT15B, FTD56, 07:55:16:00-07:55:29:00
zoom in, eos laser-sintering
RT15C, FMP831, 09:11:39:00-09:11:52:00
stratasys fused deposition modeling
RT15D, FMP830, 08:12:08:00-08:12:25:00
zoom out, objet geometries ‘3d’ printing
RT15E, FMP843, 12:09:22:00-12:09:38:00
solidscape ‘3d’ printing
RT15F, FMP840, 17:43:49:00-17:44:28:00
z corporation ‘3d’ printing

NARRATION (VO):

THERE ARE NUMEROUS MANUFACTURERS OF RAPID PROTOTYPING MACHINES, WITH THE MOST POPULAR TECHNOLOGIES INCLUDING:
STEREOLITHOGRAPHY, FROM 3D SYSTEMS...,
LASER-SINTERING, FROM EOS AND 3D SYSTEMS...,
FUSED DEPOSITION MODELING, FROM STRATASYS...,
AND THE VARIOUS ‘3D’ PRINTING PROCESSES FROM:
OBJET GEOMETRIES...,

SOLIDSCAPE...,

AND Z CORPORATION.

SCENE 11.
RT16A, FMP825, 01:05:36:00-01:05:53:00
zoom in, stereolithography operation
RT16B, FTD63, 15:10:29:00-15:10:59:00
zoom in, laser sintering operation
RT16C, FMP831, 09:23:25:00-09:23:39:00
fused deposition modeling
RT16D, FMP830, 08:08:13:00-08:08:25:00
objet geometries ‘3d’ printing
RT16E, FMP836, 13:28:31:00-13:29:13:00
z corporation ‘3d’ printing

NARRATION (VO):

WHILE SIMILAR IN THE FUNDAMENTAL APPROACH OF CONSTRUCTING PARTS ON A LAYER-BY-LAYER BASIS, EACH RAPID PROTOTYPING TECHNOLOGY OFFERS DISTINCT DIFFERENCES IN PROCESSES, MATERIALS AND ADVANTAGES. IT IS THESE DIFFERENCES THAT CAN MAKE ONE TECHNOLOGY MORE SUITABLE FOR RAPID TOOLING OVER ANOTHER.

SCENE 12.
RT17A, FTD61, 13:31:23:00-13:31:41:00
rtv mold being opened
RT17B, FTD56, 07:52:29:00-07:53:08:00
zoom out, dmls operation
RT17C, FTD61, 13:34:33:00-13:35:24:00
nanotool material being fused
RT17D, FTD61, 13:06:51:00-13:07:20:00
nanotool coming out of tank
RT17E, FTD64, 16:16:31:00-16:16:46:00
dmls operation

NARRATION (VO):

ALTHOUGH MOST RAPID PROTOTYPING TECHNOLOGIES CAN BE USED FOR INDIRECT, PATTERN-BASED, RAPID TOOLING, THE BULK OF THE DIRECT TOOLING WORK USES A METAL-BASED TECHNOLOGY SUCH AS DIRECT METAL LASER-SINTERING, SELECTIVE LASER MELTING OR LASER CUSING. YET, SOME COMPANIES HAVE HAD SUCCESS IN BUILDING MOLDS OF COMPOSITE-PLASTIC FROM STEREOLITHOGRAPHY. WHILE NOT AS DURABLE AS A METAL MOLD, THESE PROVE TO BE VIABLE FOR EARLY PROTOTYPE MOLDS AND OPERATIONS REQUIRING LOW QUANTITIES OF PARTS

--- TOUCH BLACK ---

SCENE 13.
RT18A, FTD59, 11:32:52:00-11:33:15:00
zoom in, tooling file being processed from cad data
RT18B, FTD59, 11:17:50:00-11:18:14:00
dmls tooling being built up
RT18C, FTD59, 11:55:23:00-11:55:40:00
zoom out, post processing of dmls tooling
RT18D, FTD60, 12:17:11:00-12:17:30:00
scrolling through stl file

NARRATION (VO):

THE RAPID PROTOTYPING WORKFLOW CONSISTS OF THREE STEPS:

DATA PREPARATION..., WHICH INCLUDES THE CREATION OF AN STL FILE FROM A 3D CAD MODEL AND THE APPLICATION OF BUILD-SPECIFIC CONSTRUCTION PARAMETERS.

PART BUILDING..., WHICH IS THE ACTUAL RAPID PROTOTYPING CONSTRUCTION PROCESS.

AND POSTPROCESSING..., WHICH INCLUDES SECONDARY OPERATIONS PERFORMED ON THE PART ONCE IT IS REMOVED FROM THE RAPID PROTOTYPING MACHINE.

SCENE 14.
RT19A, FTD56, 08:03:57:00-08:04:40:00
zoom out, dmls process unattended

NARRATION (VO):

COMMONLY, THESE THREE STEPS OF THE RAPID PROTOTYPING PROCESS ARE COMPLETED IN LESS THAN ONE DAY. FOR THE TOOL MAKER, ANOTHER IMPORTANT DISTINCTION IS THAT THE FIRST TWO STEPS ARE VIRTUALLY LABOR-LESS. THIS ALLOWS PATTERNS AND INSERTS TO BE CONSTRUCTED WITHOUT OPERATOR OVERSIGHT, ALLOWING TOOL MAKING STAFF TO WORK ON OTHER MOLD PRODUCTION ACTIVITIES.

--- FADE TO BLACK ---