

FROM CONCEPT TO CREATION

MAKING OF CNC SLOTTING M/C

by M/s Four M Technologies Private Limited

The logo consists of the letters '4M' in white, bold, sans-serif font, centered within a solid red square. This square is positioned on a white geometric graphic that resembles a stylized arrow or a corner bracket, pointing towards the left. The background of the entire slide is a dark blue color with a subtle grid pattern.

PROBLEM STUDY

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- THE CONVENTIONAL ELECTRO MECHANICAL SLOTTING MACHINE IS CONSIDERED AS A ROUGH SLOT PRODUCTION MACHINE WITH LOW PRECISION IN PRODUCING THE SLOTS.
- DIFFICULT TO MAINTAIN SLOT SIZE TO IT 6 AND 7 QUALITY, BECAUSE OF MACHINE CONSTRUCTION WHICH LEADS TO VIBRATIONS DUE TO IMPACT HITTING OF TOOL ON TO THE JOB WHILE SLOTTING.
- CONVENTIONAL INDEXING, EITHER BY SCALE & VERNIER METHOD OR PLUNGER INDEXING, IS NOT VERY ACCURATE AND HUMAN ERROR PRONE.
- THE SURFACE FINISH IS VERY POOR.
- TAPER AND BELL MOUTH IN SLOTS IS A USUAL COMPLAINT.
- LOAD TRANSMISSION FROM ONE OR TWO SLOTS IS ONLY MANAGEABLE, BUT IN CASE OF A SPLINE HUB THE ERRORS IN INDEXING ACCURACY AND SIZE OF SLOT AND BELL MOUTH FORMATIONS AND TAPER IN SLOT DOES NOT ALLOW THE SPLINE HUB TO PROPERLY MESH WITH THE SPLINE SHAFT FOR HIGH LOAD TRANSMISSIONS.
- TOOL RELIEVING IN THE BACK STROKE NORMALLY DOES NOT EXIST; IT IS DONE EITHER MANUALLY PUSHING THE TOOL BACK BY FEED SCREW ROTATION OR BY TOOL LIFT MECHANISM.
- THE TOOL LIFT MECHANISM, BEING PULLER AND LINKAGE, THE RIGIDITY OF SLOTTING TOOL IS NOT ENSURED CAUSING SLOT SIZE VARIATION AND VIBRATION IN SLOTTING.
- TOO MUCH OF IMPACT FOUND, CAUSING NOISE POLLUTION.
- OPERATOR FATIGUE AS DEPTH CONTROL IS MANUAL AND TEDIOUS, NORMALLY CUTTING DEPTH VARIES EFFECTING TOOL LIFE.

SOME PRACTICES FOR PRECISION SLOTTING

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IF THE BATCH QUANTITY OF SPLINE HUBS ARE MORE, IN INDUSTRIES SUCH AS AUTOMOBILE AND MACHINE TOOL INDUSTRIES , THEY GO FOR BROACHING OF SPLINES TO GET GOOD QUALITY OF SPLINES ENSURING TOLERANCES REQUIRED FOR THE APPLICATION FITS.

A CASE STUDY WAS CONDUCTED IN AN INDUSTRY WHERE THE BATCH QUANTITIES WERE LESS AND HAD A WIDE RANGE OF SPLINE HUBS TO BE PRODUCED OF HIGH QUALITY;

AN INDUSTRY WHICH MANUFACTURES TURBO-COUPPLINGS, WHERE THE SPLINE SHAFTS AND SPLINE HUBS ARE PRESSED FOR INTERFERENCE (THERMAL FIT)FOR HEAVY DRIVING POWERS REQUIRED TO PRODUCE HIGH QUALITY SPLINE HUBS

THEIR OPTION TO GO FOR BROACHING WAS RULED OUT FOR REASONS LIKE HIGH CAPITAL COSTS, HIGH POWER REQUIREMENTS, HIGH TOOLING COST INVOLVED IN THE BROACHING PROCESS WHICH WAS NOT VIABLE FOR THEIR LOW VOLUMES AND HIGH VARIETY OF HUBS BEING PRODUCED BY THEM. SO, THIS INDUSTRY IN ORDER TO GET PRECISION SPLINE IN THE HUBS, WAS PERFORMING ROUGH SLOTTING ON CONVENTIONAL MACHINES AND THEN DOING A CNC WIRE CUT OPERATION FOR GETTING THE DESIRED QUALITY OF SPLINES, THOUGH IT WAS VERY EXPENSIVE.

THIS BEING A NON-CONVENTIONAL , UNPRODUCTIVE AND COSTLY METHOD, THEY ARE IN THE LOOK FOR A SOLUTION.

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OBJECTIVES

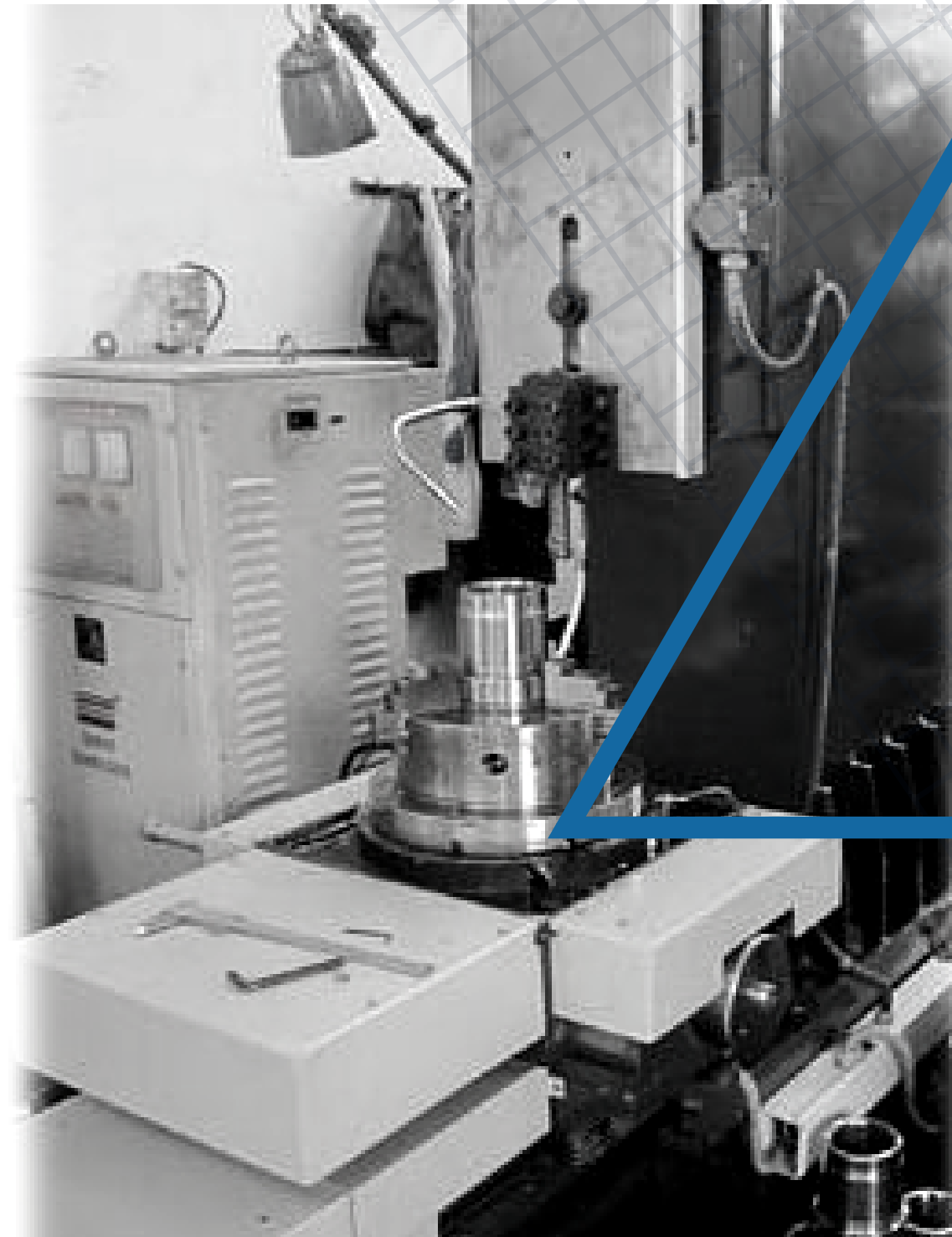


- TO ACHIEVE SLOT SIZES WITH A TOLERANCE ZONE OF IT 6 AND IT 7 QUALITY.
- TO ENSURE MINIMUM TAPER IN THE SLOT.
- TO ACHIEVE SPLINE INDEXING ACCURACY WITHIN 30 SECONDS.
- TO ENSURE PROPER FIT WITH RESPECT TO SPLINE SHAFT.
- TO ENSURE VARIABLE CUTTING SPEEDS TO OPTIMIZE FOR THE OPERATION.
- TO ENSURE VARIABLE FEEDS TO OPTIMIZE FOR THE OPERATION.
- TO ENSURE TOOL RELIEVING IN BACK STROKE TO INCREASE SURFACE FINISH AND TOOL LIFE.
- CNC/PROGRAMMABLE FOR SPEED, FEED AND INDEXING; NO OF CUTS, DEPTH OF CUT, NO OF SPLINES; ETC.

CONCEPT

- TO UTILIZE THE HIGH POWER IN CUTTING ACTION WHICH OFFERS CONSTANT, SMOOTH AND CONTINUOUS CUTTING FORCE; INSTEAD OF IMPACT LOADS IN AN ELECTRO MECHANICAL SLOTTING MACHINE.
- TO HAVE VARIABLE CUTTING SPEEDS
- TO HAVE VARIABLE CUTTING LENGTHS.
- TO HAVE INFINITELY VARIABLE FEEDS THROUGH SERVO DRIVES & CNC SYSTEM.
- TO HAVE TOOL RELIEVING IN THE BACK STROKE TO AVOID TOOL RUBBING AND INCREASE TOOL LIFE.
- TO HAVE INFINITELY VARIABLE INDEXING FACILITY TO GET VARIOUS NUMBER OF SPLINES THROUGH 4TH AXIS ROTARY TABLE (CNC)
- QPROGRAMMABLE FOR DEPTH OF CUT , NO OF CUTS, TOTAL DEPTH OF SLOT, INDEXING FOR NO OF SLOTS, ETC (CNC SYSTEMS).
- COOLANT FACILITY.

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CREATION

M/S FOUR M TECHNOLOGIES PRIVATE LIMITED ALWAYS STRIVES TO SOLVE THE CUSTOMER PROBLEMS, INVOLVED IN QUALITY AND PRODUCTIVITY ASPECTS, GIVES A SOLUTION THROUGH INNOVATION IN DESIGN AND CREATION OF MACHINE TOOLS & EQUIPMENT TO MEET THEIR REQUIREMENTS. THIS WAS THE SEED GERMINATED FOR THE CREATION OF THE CNC SLOTTING MACHINE HS-400

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4M'S CNC SLOTTING M/C

FOR PRECISION & PRODUCTIVITY

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SALIENT FEATURES



- HIGHLY RIGID CONSTRUCTION FOR HIGH MACHINE ACCURACY.
- ALL MOVEMENTS OF RAM AND SADDLE ARE CONTROLLED FROM PENDENT SWITCH PANEL, CNC CONTROLLED.
- X-AXIS MOVEMENT BY SERVO MOTOR WITH BALL SCREW AND DOUBLE NUT FOR ZERO BACKLASH AND SERVO CLAMPING.
- Y-AIXS MOVEMENT BY SERVO MOTOR WITH BALL SCREW AND DOUBLE NUT FOR ZERO BACKLASH ,
- Z-AXIS MOVEMENT BY SERVO MOTOR FOR SMOOTH, CONSTANT SHEAR FORCE, VIBRATION FREE, NOISE FREE OPERATION.
- TABLE ROTATION – AUTO INDEX THROUGH SERVO DRIVE FOR HIGH ACCURACY AND REPEATABILITY.
- AUTO LUBRICATION PROVIDED.
- EASY SETTING AND EASY OPERATION.

MODELS & SPECS



	CS-400	HS-400	HSM-400 (S)	HS-1000
RAM	:	:	:	:
Stroke	: 300 mm (max.)	: 300 mm (max.)	: 300 mm (max.)	: 500 mm (max.)
Speed	: 3–7 mts/min(var.)	: 3–7 mts/min(var.)	: 3–7 mts/min(var.)	: 3–7 mts/min(var.)
Spindle	: Slotting Tool	: Slotting Tool	: Slot Mill Spindle	: Slotting Tool
TABLE	:	:	:	:
Rotary Table	: NA. 500x500 mm	: Dia. 400 mm	: Dia 400 mm	: Dia 1000 mm
Accuracy	: NA	: 0.025 degree	: 0.025 degree	: 0.025 degree
T – Slots	: 18 mm	: 18 mm	: 18 mm	: 22 mm
TRAVERSES	:	:	:	:
X – axis	: 300 mm (Auto)	: 300 mm (Auto)	: 300 mm (Auto)	: 500 mm (Auto)
Y – Axis	: 200 mm (Auto)	: 200 mm (Auto)	: 200 mm (Auto)	: 300 mm (Auto)
Z – Axis	: 300 mm (max.)	: 300 mm (max.)	: 300 mm (max.)	: 500 mm (max.)
B- Axis	: NA	: 360 deg.(auto)	: 360 deg.(auto)	: 360 deg.(auto)
Spindle	: NA	: NA	: 13mm collet	: NA
OVERALL SIZES	:	:	:	:
Length	: 2400 mm	: 2400 mm	: 2400 mm	: 3200 mm
Width	: 2000 mm	: 2000 mm	: 2000 mm	: 2500 mm
Height	: 2000 mm	: 2000 mm	: 2000 mm	: 2500 mm
ACCESSORIES	:	:	:	:
Lubrication	: Provided	: Provided	: Provided	: Provided
Coolant Sys.	: Provided	: Provided	: Provided	: Provided
Work lamp	: Provided	: Provided	: Provided	: Provided
Guarding	: provided	: Provided	: Provided	: Provided
Std. tool kit	: provided	: Provided	: Provided	: Provided

CUSTOMERS



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