AFP KINEMATICS FOR HIGH SPEED LAYUP

GUY FAUBION
MECHANICAL ENGINEER
ELECTROIMPACT, INC.
GUYF@ELECTROIMPACT.COM
FLAT PLATES

• LOW STRESS ON MACHINE COMPONENTS
• SIMPLE MACHINE KINEMATICS
• MINIMAL ROTARY AXIS MOTION
• GREAT FOR TESTING
HIGHLY CONTOURED LOCAL SURFACE CHANGES
EFFECT ROTARY AXES ARRANGEMENT ON:

• MACHINE KINEMATICS
• MACHINE LIFE
• MACHINE COST
• OVERALL LAY-DOWN RATES

IMAGES AND TECHNOLOGY SHOWN ARE PROPRIETARY TO ELECTROIMPACT
REAL PARTS HAVE TRANSITION RADII
MACHINE KINEMATICS

• MORE DIFFICULT TO CONTROL MACHINE

• INCREASE AXES ACC/DEC REQUIREMENTS

IMAGES AND TECHNOLOGY SHOWN ARE PROPRIETARY TO ELECTROIMPACT
MACHINE LIFE

• UP LINEAR TRAVEL ➞ ➝ COMPONENT LIFE
  e.g. BEARING CARS
  BALLSCREWS
  RACK/PINIONS...

• UP MAINTENANCE

IMAGES AND TECHNOLOGY SHOWN ARE PROPRIETARY TO ELECTROIMPACT
MACHINE COST

- ↓ COMP. LIFE
- ↑ MAINTENANCE
- ↑ ACC/DEC ➔ LARGER DRIVE COMPONENTS
- ↑ LOADS ➔ ↑ SECTION AND MATERIAL
- ALL THE ABOVE ➔ ↑ COST

IMAGES AND TECHNOLOGY SHOWN ARE PROPRIETARY TO ELECTROIMPACT
LAY-DOWN RATE

• POOR MACHINE KINEMATICS LEADS TO:

REDUCED LAY-DOWN RATE

IMAGES AND TECHNOLOGY SHOWN ARE PROPRIETARY TO ELECTROIMPACT
PART SMOOTHING

TOW COMPACTION ROLLER

ROAD GRADER FUNCTION
FIXED LENGTH

PART SURFACE
6deg RAMP

DIRECTION OF TRAVEL

IMAGES AND TECHNOLOGY SHOWN ARE PROPRIETARY TO ELECTROIMPACT
PART SMOOTHING
NORMAL VECTORS

EFFECTIVE PART RADIUS ~2m
AXIS CENTER 1000mm
NORMAL VECTORS
PART SURFACE 6deg RAMP
ROAD GRADER

• PROS:
• SMOOTHER MACHINE KINEMATICS
• HIGHER LAY-DOWN RATE

• CONS:
• TOOL PATH DOES NOT FOLLOW PART SURFACE
• NO LONGER NORMAL TO SURFACE
• CAN LEAD TO POOR COMPACTION IN TROUGHS

IMAGES AND TECHNOLOGY SHOWN ARE PROPRIETARY TO ELECTROIMPACT
AXIS ABOUT TOOL POINT

ROTARY MOVE ONLY

6°

DIRECTION OF TRAVEL

AXIS CENTER

IMAGES AND TECHNOLOGY SHOWN ARE PROPRIETARY TO ELECTROIMPACT
GOAL: AXIS ABOUT TOOL POINT

• MAJOR AXES -- PART SURFACE
• ROTARY AXES -- NORMALITY AND STEERING
• IMPROVED MACHINE KINEMATICS
• IMPROVED MACHINE CONTROLLABILITY
• DECREASED MACHINE WEAR AND TEAR
• INCREASED LAY-DOWN RATES

IMAGES AND TECHNOLOGY SHOWN ARE PROPRIETARY TO ELECTROIMPACT