ADVANCED TUBULAR TECHNOLOGIES, INC

CNC BENDER

v11-20080723

Robot UNLOAD Logic

STANDARD CNC BENDER ROBOT **UNLOAD** LOGIC

- STEP 1
  - CNC Bender Process Setup
    - Start a Secondary Process: **Robot_Unload_Part1**
      - This process loops with a conditional test - watching for the bend arm to come to the final bend angle.
- STEP 2
  - CNC Bender Moves
    - Bend the last bend
    - Extract the mandrel
- STEP 3
  - CNC Bender Signal
    - When the final bend angle is achieved, then Robot_Unload_Part1 process sends a command to the robot: **SignalToRobot_CycleComplete**
      - This signals to the robot that it can move in to unload the part
  - CNC Bender Pauses and Examines Robot State
    - **WaitForRobotToSetCycleMachineInputActive**
      - This command WAITS for the robot to set the Cycle Machine active
      - This means that an unloading is in the bender
- STEP 4
  - Robot Moves
    - The robot moves into position over the tube
    - The robot grips the tube
  - Then Robot Signals
    - The robot CYCLE MACHINE output is set to **ACTIVE**
      - This indicates that the robot is IN the bender and that the tube is gripped. It triggers the CNC Bender command **"WaitForRobotToSetCycleMachineInputActive"** to complete and allow CNC Bender to move to the next step
- STEP 5
  - CNC Bender Moves
    - All Dies OPEN
  - Then CNC Bender Signals
    - **SignalToRobot_ClearCycleComplete**
      - This indicates to the robot that the chuck is open and that the robot can remove the part
  - Then CNC Bender Pauses to Examine an Input
    - **WaitForRobotToSetCycleMachineInputInactive**
      - This command WAITS for the robot to set the Cycle Machine inactive. When command is complete, then the ROBOT has signaled that it is out of the bender
- STEP 6
  - Robot Moves
    - Out of the bender
  - Then Robot Signals
    - The robot CYCLE MACHINE output is set to **INACTIVE**
      - This indicates that the robot is OUT of the bender. The robot output is monitored by the CNC Bender command **WaitForRobotToSetCycleMachineInputInactive as an input** to pause the process before moving to the next step.
- STEP 7
  - CNC Bender Moves
    - Move the bend arm to home
    - Pause until **Not** End Cycle
    - Move to beginning of part process

Initial Cell State for Bending / Handling Part

- CNC Bender is in AUTO mode
- Robot: Is AWAY from bender
- CNC Bender: Is getting ready to form last bend

This logic is for an UNLOADER TYPE of "Bend-Robot" in the Post-Bending Menu.

- This is a Post-Bending option that indicates to CNC Bender that it should interact with the robot with the bend arm out and paused at the last bend