

# Hydraulic CNC Axis

## Power

### ✓ Power Cube

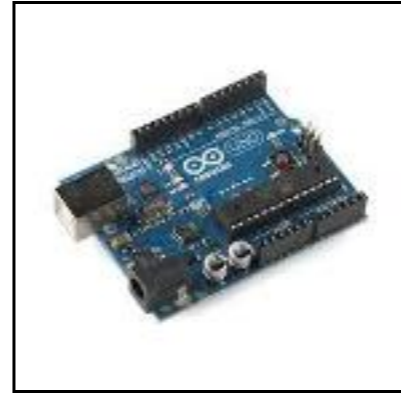
- Efficiency will be very low in case of fixed displacement pumps (gear pumps)
- Variable displacement pumps (piston pump with pressure regulation valve) would be preferable but more costly (addition of a hydraulic accumulator mandatory in that case)
- The cooler size needs to be reviewed due to regulation use (basic rule of thumb for regulation purpose 70% of the whole energy is lost and needs to be dissipated)



## Controller

### ✓ Arduino

- PID controller in the case of proportionnal hydraulic valve
- PID controller and PWM generator to pilot the 4 ON/OFF valves



## Hydraulic distributor

- Final performances of the Hydraulic Axis rely mainly on this component
- To be mounted directly on the hydraulic drive to increase dynamics
- A hydraulic accumulator on the Inlet would be greater

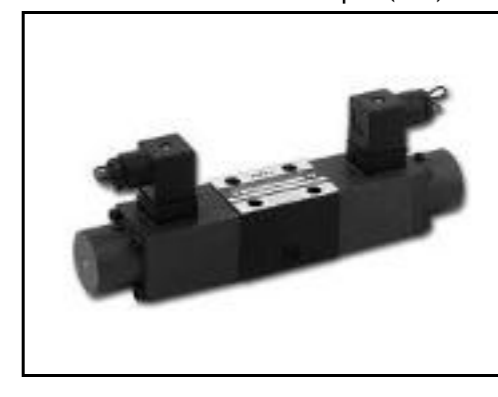
### Servo valve

- Very high cost
- High dynamic performance
- Needs clean oil (very clean oil)
- Needs a dedicated amplifier
- The controller is simple (PID)



### Proportionnal valve

- Intermediate cost
- Intermediate performance
- Needs a dedicated amplifier
- The controller is simple (PID)



### ✓ ON/OFF valve

- Needs 4 ON/OFF valves to replace a 4/3 valve
- Each valve is fast
- Very easy to operate (needs only 12/24V DC, no needs of amplifier)
- The controller will be more complex (kind of hydraulic PWM)
- Very cost effective and tolerant to oil dirtiness
- The performance of the complete system can't be forecasted



## Drive

### Hydraulic motor

- Needs a mechanical system to convert rotational motion
- Small



### Belt

### Rack and Pinion

### Trapezoidal screw

### Ball screw

### ✓ Hydraulic cylinder

- Easy
- Takes place (two times the stroke for non-symmetric cylinder and 3 times for a symmetric one)



## Sensor

### Laser

### LVDT

### Magnetostrictive

### Resistive

### ✓ Wire

- Easy to integrate
- Cost effective
- Medium accuracy

