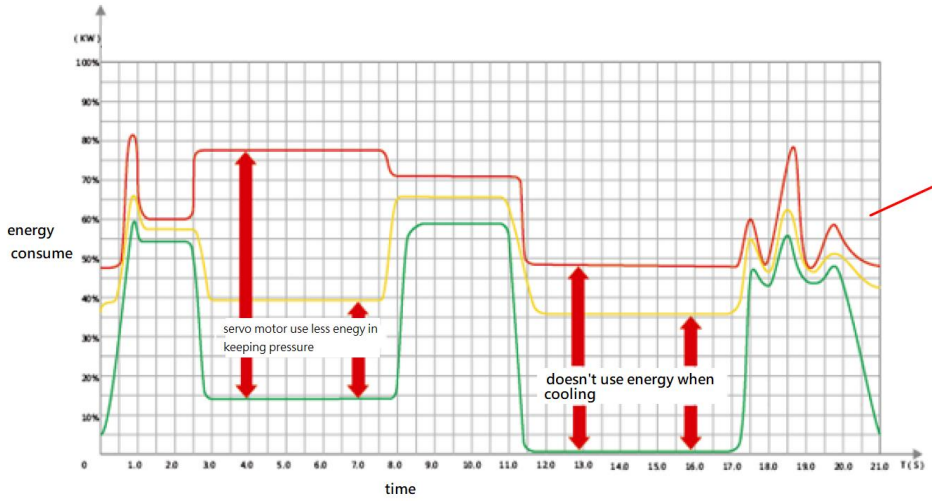
Case name	Shihlin SA3 on slitting machine				
Department	FA engineer group	date	2016-5-2	page	4
Product	SA3 series		code	ANI00019	

1.Introduction

The injection molding machine is mainly used for the molding of thermoplastics. Injection molding machine molding is a predetermined periodic action process. A complete production cycle mainly includes several stages : mold clamping, injection, pressure holding, melting, cooling, mold opening and ejection. The injection molding machine controls the movement with hydraulic transmission. It mainly contains oil pump, hydraulic control valve, pressure electromagnetic proportional valve, flow electromagnetic proportional valve, various action cylinders, oil pump motor and other hydraulic accessories and pipelines. The hydraulic transmission injection molding machine is a typical cyclically variable load device. The working pressure and flow rate required for each process stage are different. The load of the hydraulic system varies greatly. For the traditional electric pumping pump hydraulic system, it rely on the flow valve and the pressure valve to regulate flow and pressure at different stages of the process. Since the dosing pump output power cannot be adjust, the excess energy can only be consumed by the baffle, oil leakage, and oil temperature rise, therefore causing a large amount of energy waste, it is more energy-efficient to use the inverter.

The servo-type inverter which drive synchronous and servo motor oil pump has many advantages such as high energy saving rate, high frequency torque and high efficiency compared with the common inverter driven asynchronous motor drive. The servo inverter has fast response and small torque response time, the servo-type inverter drive motor hydraulic energy consumption is 30% less than the traditional injection molding machine, so the servo-type inverter has been widely used.



Energy consume chart

Picture of the machine

2.Req

1.The customer requests to use the injection molding machine system to send the target pressure

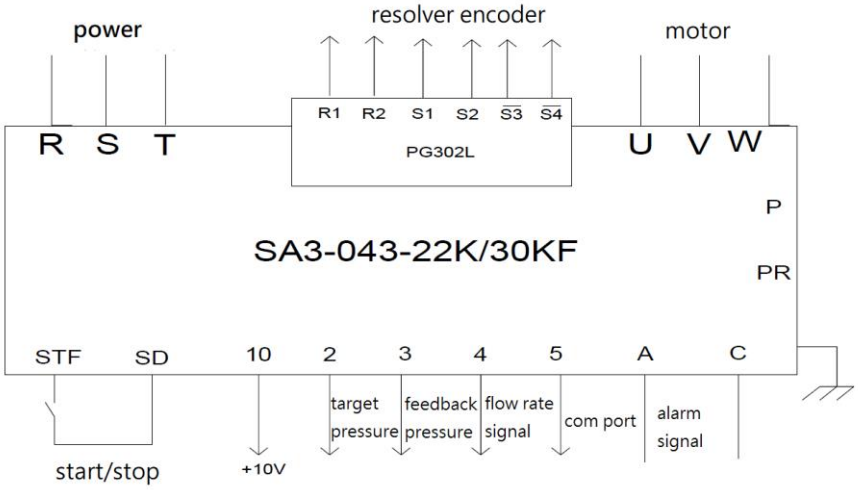
signal to the inverter. The inverter adjusts the PID according to the pressure signal feed back from the pressure sensor in the oil drum. When the feedback signal is smaller than the target signal, the flow signal is given by the upper machine of the injection molding machine, the pressure in the oil drum and the target pressure are balanced at the end, and the injection molding machine system is shown in Figure 1.
Note: The target pressure signal is to convert 0-12Mpa to 0-10V analog signal input to the inverter, and the feedback signal is to convert 0-25Mpa (pressure sensor range) into 0-10V analog signal input inverter. The flow signal is also a 0-10V analog signal given by the injection molding machine system.

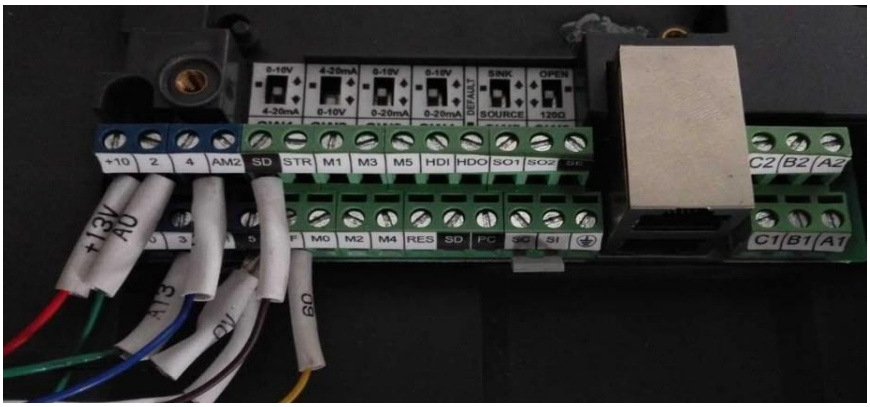
Figure 1

Figure 2

2. In this case, the inverter drive motor is a synchronous motor (Fig. 2), and the motor is equipped with a resolver type encoder.
3. The inverter is selected from Shihlin SA3-043-22K/30KF, and the drive motor is 380V/22KW.

3.Wiring





4.Parameter setting

serial	number	name	default	Set value	serial	number	name	default	Set value
1	P.7	Acceleration time	20	0.2	15	P.302	Motor rated power	0	22
2	P.8	Dceleration time	20	0.2	16	P.303	Motor poles	4	8
3	P.17	4-5 signal select	0	1	17	P.304	Motor rated voltage	440	380
4	P.73	2-5 signal selet	0	1	18	P.305	Motor rated frequency	50	133.33
5	P.170	PID function select	0	13	19	P.306	Motor rated current	0	41
6	P.171	PID feedback type	0	0	20	P.307	Motor rated rpm	1410	2000
7	P.172	Proportional gain	20	200	21	P.350	Encoder pulse per round	1024	1024
8	P.173	Integral time	1.00	0.1	22	P.351	Rncoder input type	0	1
9	P.174	Derilative time	0	0	23	P.500	2-5 function select	1	3
10	P.221	Sample value lower limit	0	36	24	P.501	4-5 function select	1	4
11	P.222	Sample value upper limit	0	1718	25	P.504	3-5 function select	0	18
12	P.223	Analog feedback signal bias	0.0	2	26	P.724	-	-	1
13	P.224	Analog feedback signal gain	100	100	27	P.727	PID reverse function	-	0
14	P.300	Motor control method select	0	5	28	P.728	PID reverse integral limit	-	0

5.Tunning instruction

1. Motor self-learning part: including P.300, P.301, P.302, P.303, P.304, P.305, P.306, P.307
P.300: for motor control mode selection, in this case 5
P.302-P.307: This is the motor rated parameter, set according to the motor nameplate
P.301: Motor parameters auto measure
In this case, a synchronous motor is used and the resolver encoder is assembled, so it is necessary to set P.301=8, 9
Set P.301=8, execute the synchronous motor parameter auto measure function, press the panel FWD, the inverter will automatically calculate the P.313-P.316 parameter.
Correctly set P.350, P.351, set P.301=9, execute the synchronous motor Z phase position auto measure function, be sure to completely disconnect the motor and load, press the panel FWD, the inverter will automatically calculate P.317
Set P.79=1 Press FWD key, TUN will appear and the motor will run. After a few seconds, TEND will indicate auto measure complete. If FAL appears it indicates self-learning failure, check the above steps and start over.

Note: In this case, the rated frequency f of the motor should be set according to the formula n=60/P*F, n=2000r/min, p=4, so f=67Hz ie P.305=67

2. Encoder part: including P.350, P.351, P.352, P.354.
P.350: Encoder pulse number, this case selects 1024.
P.351: Encoder A, B phase sequence, select 1 for this case. (Note that the value of P.351 is related to the phase sequence of U, V, W. Remember not to change the phase sequence of U, V, W , if you really need to change set P.351=2 at the same time, otherwise it will cause encoder feedback error, inverter current increases and significant jitter on motor .)
P.352, P354: PG card alarm time, this case is selected 1.
After setting the above parameters, change P.161=10, press FWD key, the motor starts running, monitor the inverter current and voltage files, whether the load current is normal, whether the feedback frequency is normal, if there is abnormal change P.351=2, no abnormal, then complete.

3. PID part: including parameters P.170, P.171, P.172, P.173, P.174, P.221-P.224, P.727
P.170: PID function selection, this case is 13 (2-5 terminal input as the target value, 4-5 terminal input as the feedback value)
P.171: PID feedback control mode selection, this case is 0, PID is negative. (When the feedback value is greater than the target value, reduce the output frequency, when the feedback value is less than the target value, increase the output frequency)
P.172, P.173, P.174: PID adjustment parameters, adjusted according to the on-site PID response status
P.221~P.224: PID feedback range calibration (corrected when the analog terminal receives the PID feedback signal, the calibration method is detailed in the product operation manual)
P.727: PID allows reverse action selection, this case is 0 (PID does not allow reverse)