ISSN 1453 - 7303
"HIDRAULICA" (No. 3-4/2012)
Magazine *of Hydraulics, Pneumatics, Tribology, Ecology, Sensorics, Mechatronics*

SYNTHESIS OF MAIN CHARACTERISTICS AND COMMON SCHEMES USED IN STRUCTURING OF HYDRAULIC SOURCES

Radu RADOI[1], Catalin DUMITRESCU[1] , Iulian DUT U[1], Gabriela MATACHE[1]

[1] INOE 2000 - IHP, radoi.ihp@fluidas.ro, dumitrescu.ihp@fluidas.ro , dutu.ihp@fluidas.ro , fluidas@fluidas.ro

Abstract:

The various mobile or in dustrial applications with hydraulic drives require hydraulic supply sources which to provide hydraulic oil to them with a given flow and pressure. These sources may be classified according to the nature of their construction, circuit or drive motor of the pump. For different destinations, depending on the required power, are used various types of pumps (pumps with tooth wheels, with axial pistons, with pallets or with screw. In the article are presented the range of parameters generally used (pressures, geometric volumes and speeds) and basic diagrams in use for sources with continuous flow, with flow steps, with constant flow, with adjustable pressure and servodrive in close circuit.

Keywords*: hydraulic sources, continuous adjustment, flow steps, constant flow.*

1. Introduction

Power supplies with hydraulic oil for operating various mobile or industrial machines are always related to the existence of a primary motor so that the hydrostatic energy is actually produced by the engine pumps in which the primary motor is electric, thermal and rarely pneumatic. The association pump – motor open a new perspective to the arrangement of the two parts, so that the flow range obtained to be wider at a given pressure.

2. The classification of the hydraulic sources

The classification depends on the type of pump and on the operating circuits or on the drive motor.

– after the nature of the construction the source may be with continuous variable flow or in steps and with constant flow at constant speed.

– after the nature of the circuit the source may be in open, closed or half closed circuit

- after the type of primary motor

With fast, thermal motor

- With triple phase asynchronous electric motor with constant or variable speed
- With electric motor with variable speed supplied in direct current

- types of pumps on destinations

- With tooth wheels with evolvent simple double triple tooth, with auxiliary devices incorporated (pressure valve or flow regulator)or without – for the auxiliary bottoms and low power drives (< 10 kW)
- With axial pistons with inclined block simple or double – for average power drives in open circuit
- With axial pistons with inclined disk – for drives in closed cicuit especially for average and high power drives but also in open circuit for average power drives
- With screw – for low pressure circuits (< 1,6 MPa) on which are not admitted flow pulsations higher than 5‰
- With simple or double pallets – for low or average power drives.

- General technical characteristics

- Compact modular structure encapsulated with filtering system for tank and cooling system incorporated;
- With hybrid drive microelectronics incorporated
- With modular components allowing operative maintenance
- Low level of noise and vibrations (< 50 dB)
- Changeable weight adjusting at various emplacements.

3. Operational parameters used

- Drive pressure		6,3	16,0	21,0	32,0	42,0	(MPa)
- Auxiliary pressures		0,8	2,5	6,3	25		(MPa)
- Geometrical volumes pumps							
	• Auxiliary circuits	1 ... 20					
	• Operational circuits	1 ... 20		25 ... 63		80 ... 125 (cm^3/rot)	
- Nominal drive speeds of the primary motor							
	• Thermal	600...1000		1800...2600		(rot/min)	
	• Electric	750		1000...1500		3000 (rot/min)	

4. Ordinary principle diagrams

Fig. 1 represents source with continuous variable flow proportionally regulated with signal given by the discriminator D which receives the regulation signal x_i (regulation current) and the effective flow value measured by the flow transducer (T).The variable pump has in tandem a pump

with constant flow which supplies with drive pressure. The adjustment device DA) may be pressure regulator (a) pressure and power regulator (b) or servodrive (C).

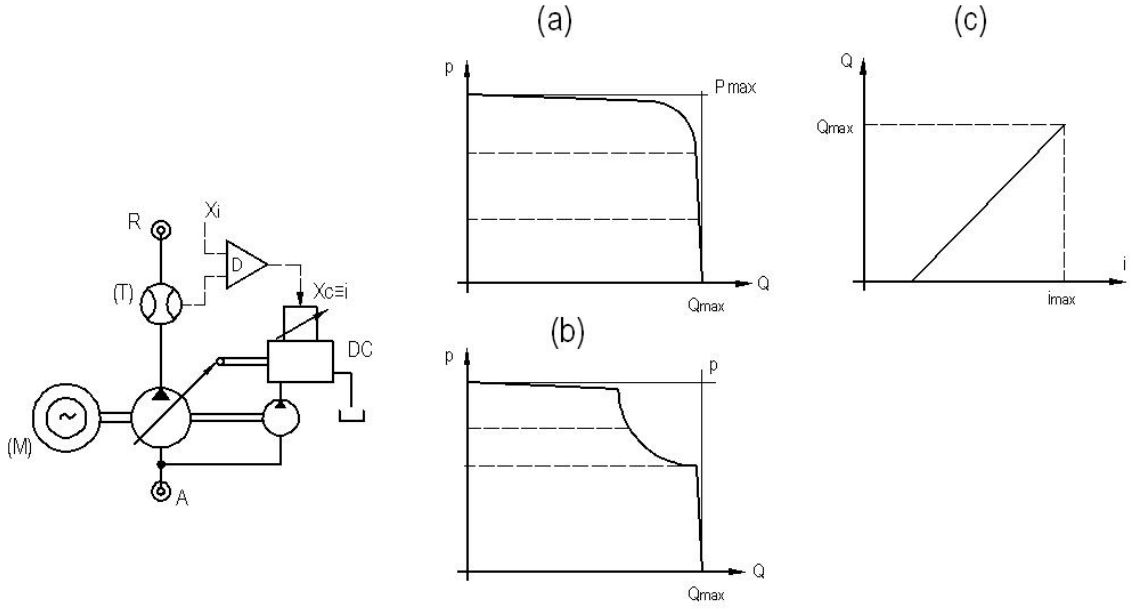


Fig. 1

Fig. 2 represents a source which may give three flow steps, having a double wheeled pump by commuting the electromagnets S1, S2, S3A, S3B at prompt X; associated to signal. Due to the fact that the flow relation of the two pumps is two are obtained max.flows Q, 2Q, 3Q as is specified in table 1.

Table 1

flow	S1	S2	S3A	S3B
Q		+	+	
2Q	+			+
3Q	+	+		

S1, S2 the electromagnets of the pressure connecting valves

S3A, S3B electromagnets of the circuits selecting distributor

The operational mode may be the following: with the pump Q active it is varied speed of motor(M) from n_{min} until n_{max} at which the flow transducer (T_q) commands that only pump 2Q to be active and the regulated speeed by means of the speed transducer (T_n) regulates motor (M) asynchronous variable at speed n_1 then it varies it up to n_{max} at which (T_q) commands the drive of both pumps and brings the speed of (M) at (n_2) after which varies speed up to n_{max}.

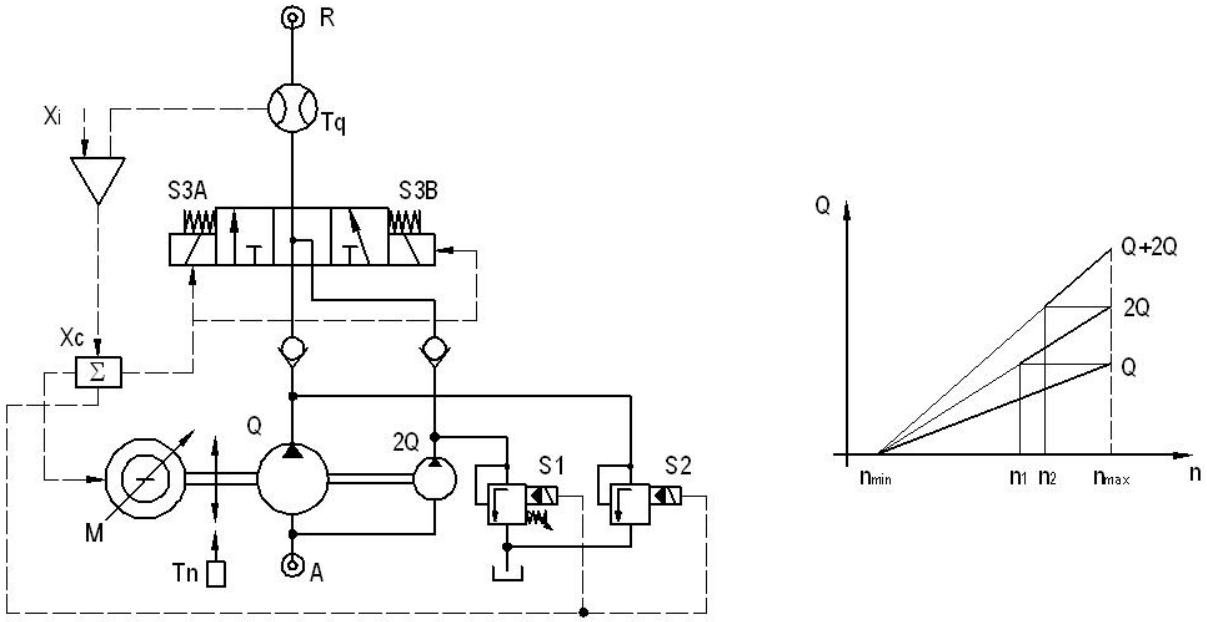


Fig. 2

Fig. 3 represents a source based on a pump with constant flow driven by a variable c.c. motor which has two modalities for adjusting flow:

- At constant current for the electromagnet of the flow regulator (R_q) varying the motor speed (M).
- At constant speed of (M) varying the electromagnet current (R_q).

The operational mode may be described as follows: varying the speed of (M) until it reaches flow Q_{max}. The flow may be adjusted varying the current from (R_q) until a $Q_0 < Q_{max.}$ Sthe flow may be varied decreasingly to $Q_1 < Q_0$ after which is adjusted at a new step. The two possibilities of changing flow by conjugated variation and regulation may lead to an accurate programming of each flow from the triangle ABC.

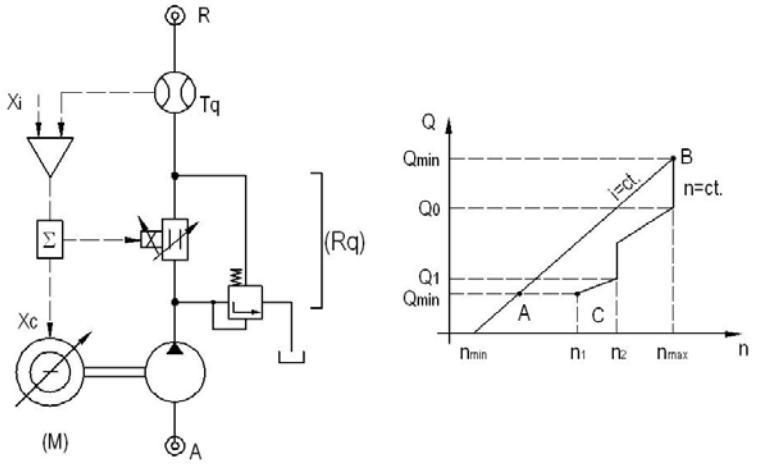


Fig. 3

Fig. 4 represents a source based on an electropump M) + (P) with constant flow with asynchronous motor (M) whose pressure may be adjusted by means of the proportional valve (SP) externally driven by signal x_i.

In derivation the pump (P) supplies the accumulator (A) when the electric distributor (DE) it is found in the preferential position.

The system works in 4 ways as shown in table 2

Table 2

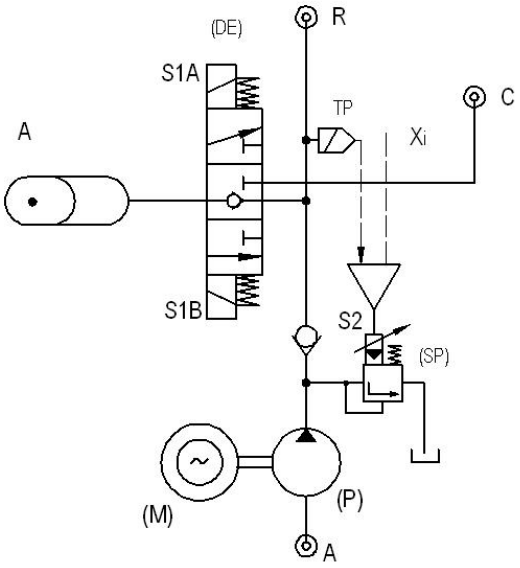
Nr.	Phase						
		X_i	TP	S1A	S1B	S2	M
1	Charging accumulator	+/-				+/-	+
2	Varying pressure on circuit R	+	+			+	(+)
3	Compensation pressure leap	+/-	+	+		+/-	(+)
4	Circuit supply C	+	+/-		+	+/-	(+)

LEGEND

+/- indifferent

+ driven – supplied

(+) maintain supply



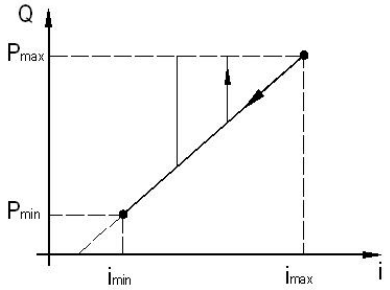


Fig. 4

Fig. 5 represents the source based on variable pump (PP) in closed circuit regulated by means of the regulation device (DR) with servocommand type proportional drive which has incorporated the auxiliary pump (P) which discharges through the priority valve(VP) flow at drive pressure (below 6,3 MPa) and which serves primarily the compensation circuit of the closed circuit. (M) asynchronous motor, (TQ_1) şi (TQ_2) flow transducers.

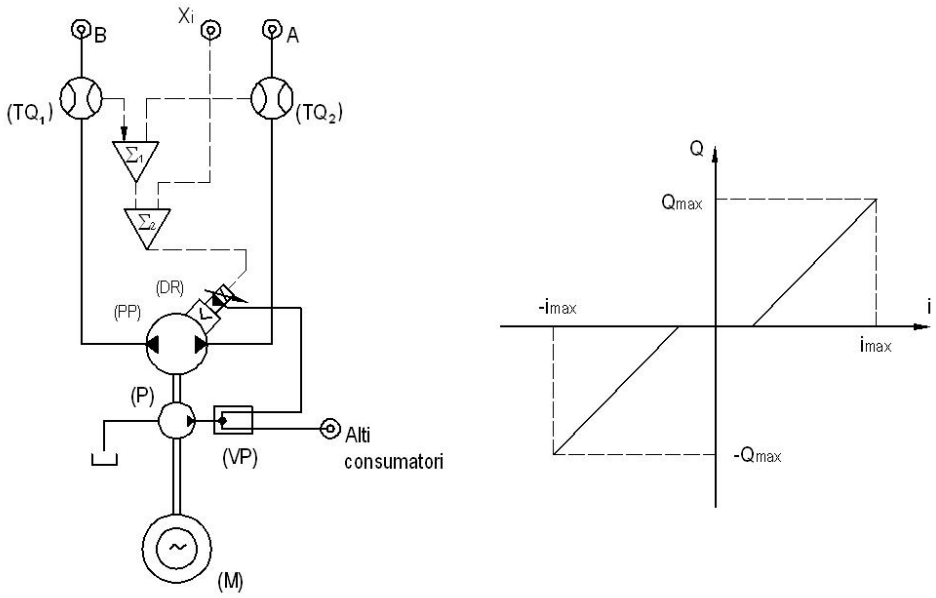


Fig. 5

All the integrated systems are assumingly having sensorics – flow, presure, speed transducers and hybrid microelectronics incorporated, cause the source systems are assumed to be integrated to some complex automation systems.

REFERENCES

[1] C. Turcanu, N. Ganea "Displacement pumps for fluids", Technical Publishing House, Bucharest, 1987
[2] Guillon, M., Commande et asservissement hydrauliques et electrohydrauliques, Editions Lavoisier, Paris, 1996.
[3] http://www.automation.siemens.com/mcms/mc/en/mechanical-engineering/plastic-machines/servopump/pages/servopump.aspx