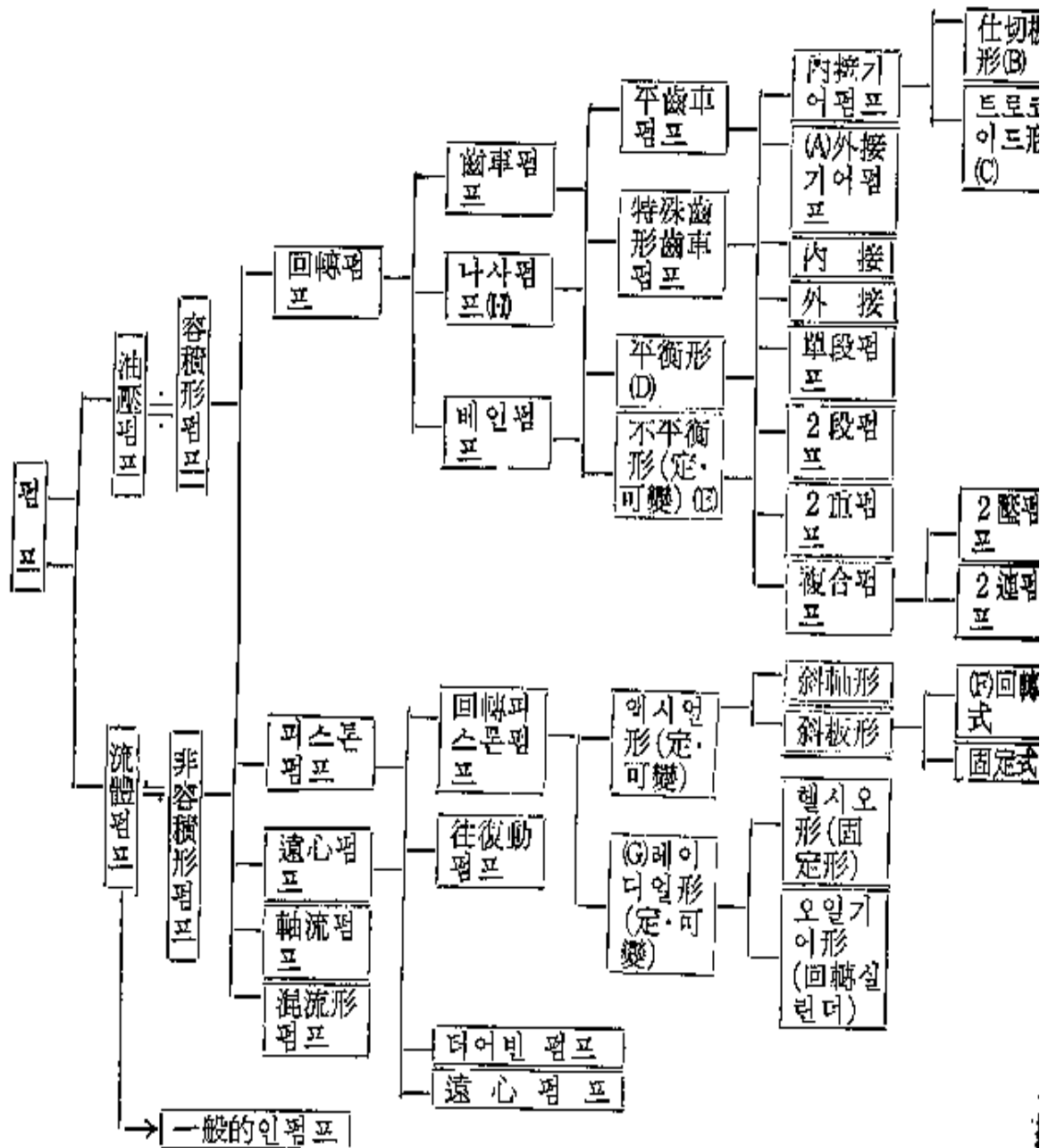


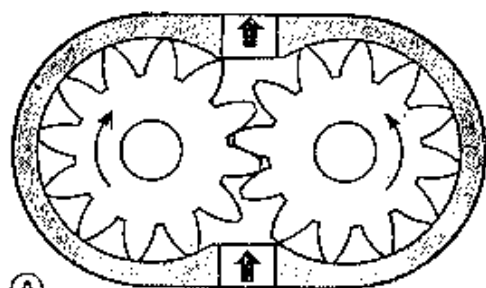


제 3 장 유압 펌프

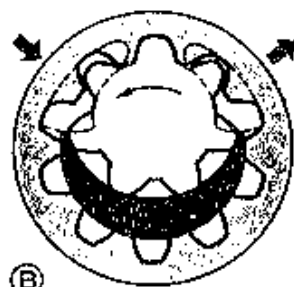
1. 서론

1-1. 유압펌프의 분류

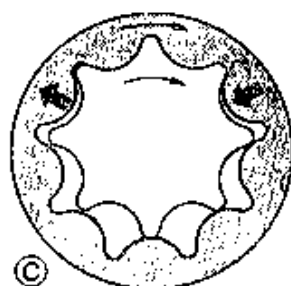




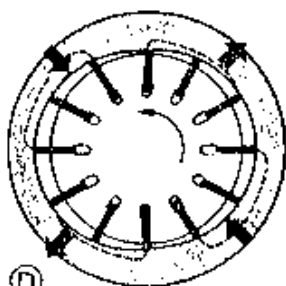
(A)



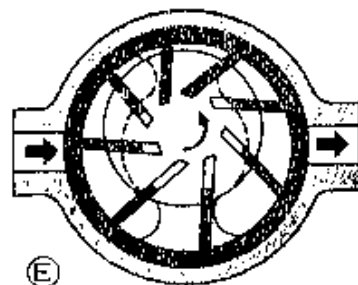
(B)



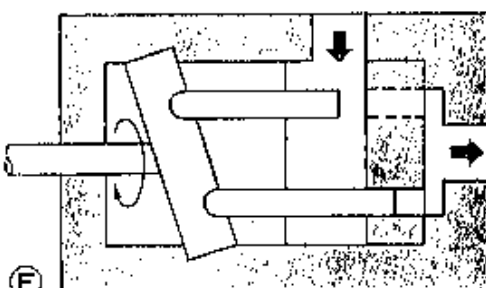
(C)



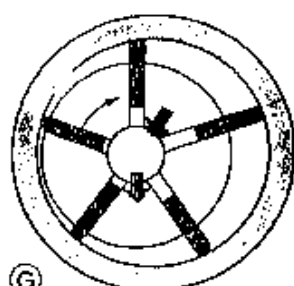
(D)



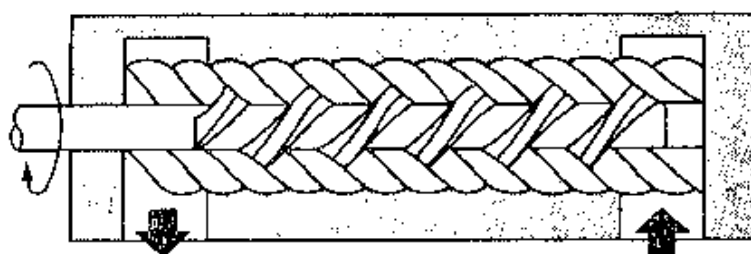
(E)



(F)



(G)



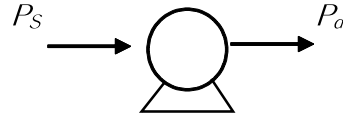
(H)

2. 유압펌프의 동력과 효율

Pump의 흡입압력 : P_s (kg_s/cm^2)

Pump의 토출압력 : P_d (kg_s/cm^2)

Pump의 실투출유량 : Q (cm^3/sec)



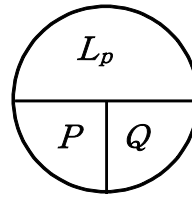
$$P = P_d - P_s \text{ (펌프 입 출구의 압력차)}$$

2-1. L_p (Pump 동력 ; 수동력, 유체동력)

$$L_p = P \cdot Q \text{ [} kg_f \cdot cm/sec \text{]}$$

$$= \frac{P \cdot Q}{7,500} \text{ [PS]}$$

$$= \frac{P \cdot Q}{10,200} \text{ [KW]}$$



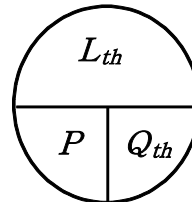
일반적으로 P [kg/cm^2], Q [$\ell/min.$] 일 때는

$$L_p = \frac{P \cdot Q}{450} \text{ [HP]} = \frac{P \cdot Q}{612} \text{ [KW]}$$

2-2. L_{th} (이론 유체동력) : Piston & Cylinder 사이에 누출이 전혀 없을 경우

$$L_{th} = P \cdot Q_{th}$$

Q_{th} ; 이론 토출량 (m^3/sec)



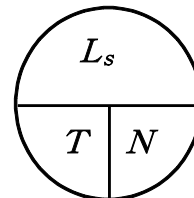
2-3. L_s (Pump 축동력) : 원동기로부터 Pump축에 전달되는 동력

T : Pump를 회전시키는데 필요한 회전력 T ($N \cdot m$), \bar{T} ($kgf \cdot m$),

N : Pump의 회전수 (rpm)

$$L_p = \frac{T \cdot N}{9,550} \text{ [KW]} = \frac{\bar{T} \cdot N}{974} \text{ [KW]}$$

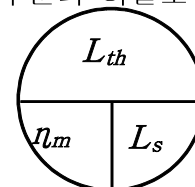
$$L_p = \frac{T \cdot N}{7,020} \text{ [HP]} = \frac{\bar{T} \cdot N}{716} \text{ [HP]}$$



2-4. η_m (기계효율 ; Mechanical Efficiency) : Pump의 회전부분의 마찰로 인하여 동력손실

$$L_{th} = L_s - \Delta L \text{ : (理論動力)}$$

$$\eta_m = \frac{L_{th}}{L_s} \times 100 \text{ [%]}$$

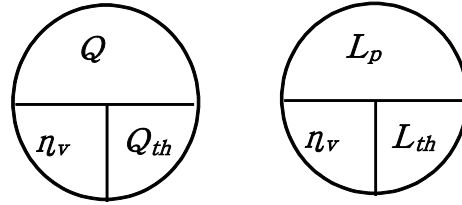


ΔL

2-5. η_v (용적효율 ; Volumetric Efficiency)

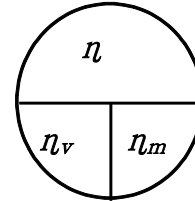
$$\eta_v = \frac{Q}{Q_{th}} \times 100 [\%]$$

$$= \frac{L_p(PQ)}{L_{th}(PQ_{th})} \times 100 [\%]$$



2-6. η (펌프 전효율 ; Overall Efficiency)

$$\eta = \eta_v \cdot \eta_m = \frac{L_p}{L_{th}} \cdot \frac{L_{th}}{L_s} \times 100 [\%]$$



$$\therefore L_p = L_s \cdot \eta$$

$$Q_{th} = q \cdot N \begin{cases} Q_{th} ; \text{이론 토출량 [cm}^3/\text{sec]} \\ q ; \text{1 회전당 토출량 [cm}^3/\text{rev.]} \\ N ; \text{회전수 [rps]} \end{cases}$$

EX 3-1> $Q = 30 \ell / \text{min.}$

P (토출압력) = 70 kgf/cm^2 일 때

Pump 동력 (L_p) = ?

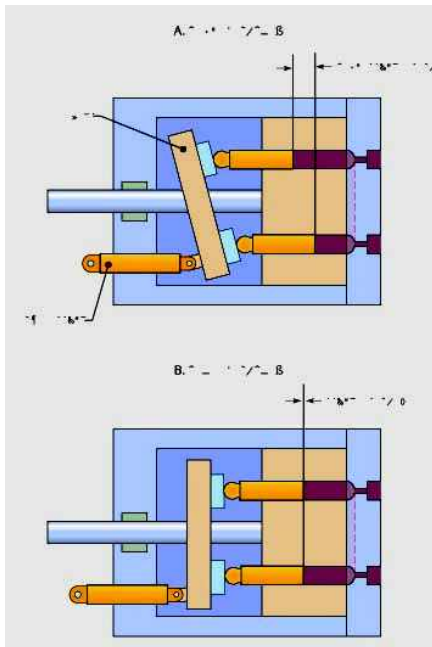
Pump 전효율 (η) = 80 % 일 때 운전에 필요한 전동기의 최소마력 (L_s) = ?

3. Piston Pump

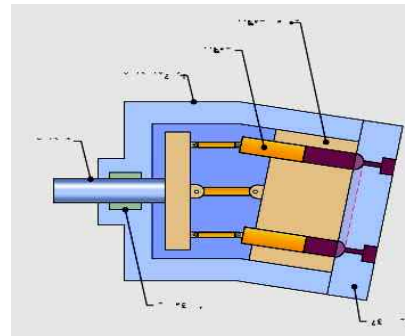
: Piston or Plunger의 왕복운동에 의한 용적변화를 이용하여 유체를 흡입측에서 토출측으로 토출하는 형식. (Piston의 수는 9개 많이 사용) 주로 가변 토출량형 Pump

* 고압용 (140~500(kg/cm²) 토출량 1~1350 l/min

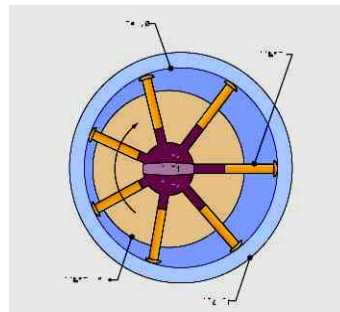
$\eta = 85 \sim 95 \%$ (정토출량, *(주)가변토출량)



사판식 액시얼 피스톤 펌프

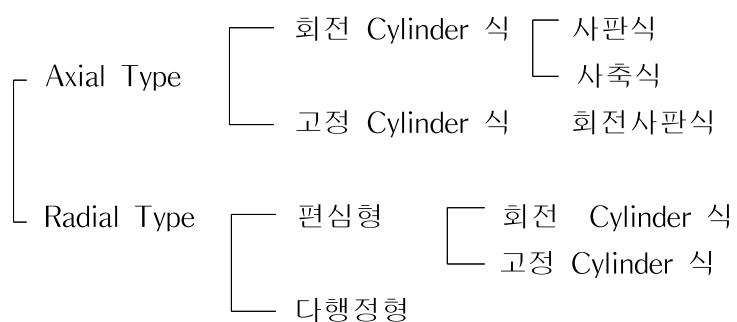


사축식 액시얼 피스톤 펌프



레이디얼 피스톤 펌프

종류와 구조



(1) Axial Piston Pump ; 여러개의 Piston이 동일 원주상 축방향으로 평행하게 배열된 Pump.

(2) Radial Piston Pump ; 최대 회전수가 낮고 고압, 용적효율이 높다.
거의 가변 토출량형.

☆토출량을 변화시키는데 Cylinder Block 축 & 구동축의 각도 변화

(Bent Axis Axial Piston Pump) : 사축식

Cylinder Block 축 & 구동축 동일 축상에 배치하고

경사판(swash plate)의 각도변화 : 사판식

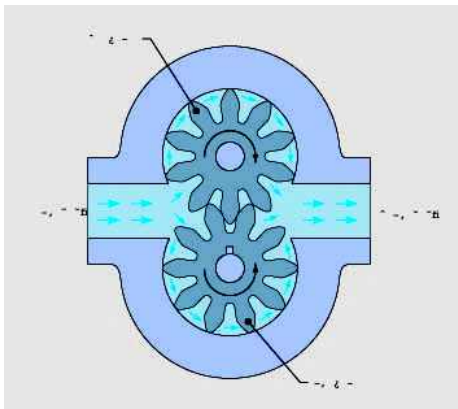
4. Gear Pump

(1) 외접 기어펌프

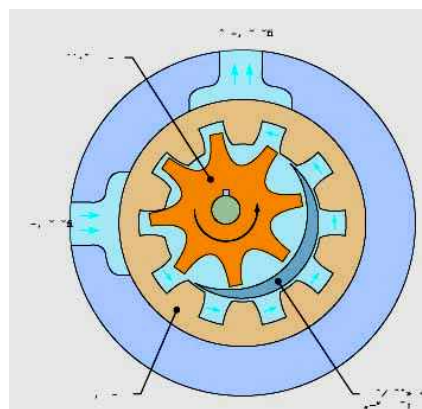
(2) 내접 기어펌프

(3) 트리코이드 기어펌프

(4) 나사 기어펌프



외접 기어펌프



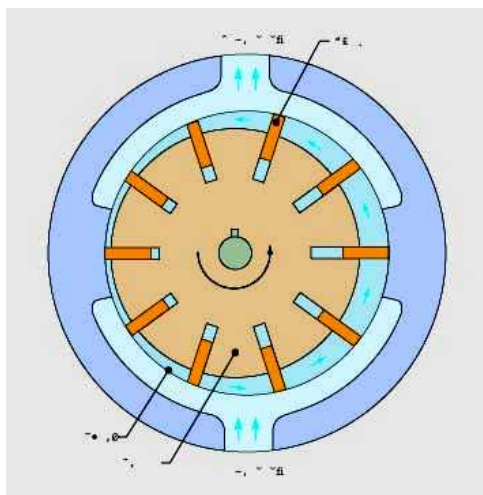
내접 기어펌프

5. Vane Pump

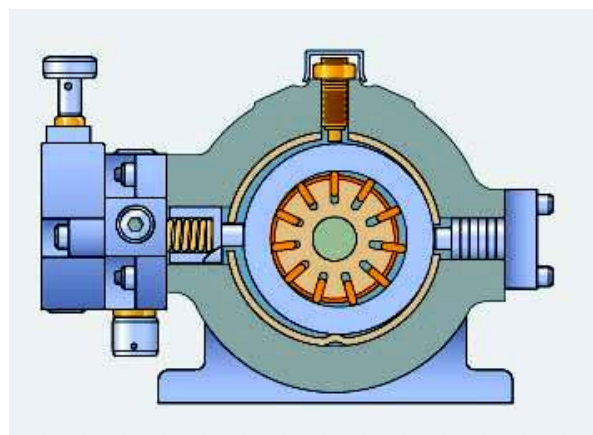
정용량형 (Fixed Displacement Type.)

가변용량형 (Variable Displacement Type.)

* 공작기계, 프레스, 사출성형기, 차륜용등에 사용

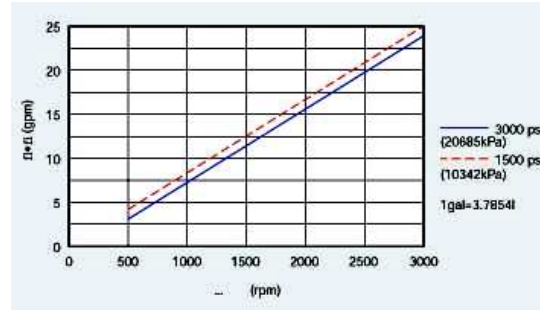
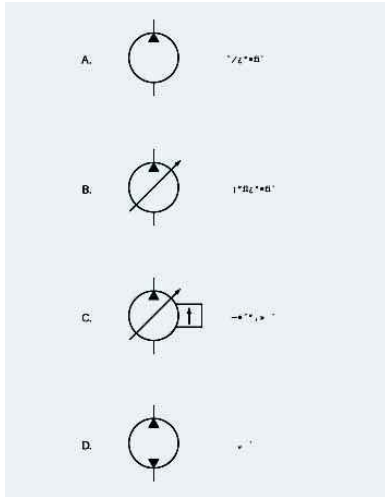


불평형형 베인펌프



압력보상형 베인펌프

6. 유압 Pump 의 기호



7. 펌프의 규격

7-1. 행정체적, 유량 및 구동속도

7-2. 압력

7-3. 효율

7-4. 유압유

7-5. 여파 (Page 71 그림 3-24 참조)

7-6. 소음 (OSHA; 8시간 90 dB 이상 노출 금지) ; 일반적으로 60 ~ 80 dB

7-7. 구동축회전

7-6. 입구압력

