BASIC PRINCIPLES

Things to consider when designing:

1) **Flow rate:** 6372 l/min (2900T PSG), 9828 l/min (4700T PSG), 7320 l/min (2900 MWS), 12018 l/min (4700 MWS)
    a.i. specific gravity/density: $\rho = 958{,}7\ kg/m^3$ (EES)
    SG = 958,7/1000 ≈ 0,96
    → conversion factor = 1,0
    a.ii. viscosity - Generally with higher viscosities there is a reduction in flow through the nozzle. Viscosity also affects the spray pattern and spray quality: 0,000282 kg/(s · m) (EES)
2) **Operating pressure:** 7-8 bar (Large operating pressure enable small nozzle outlet diameters)
3) **Spray pattern:** solid cone
4) **Spray angle:** 99°-108° (2900T PSG), 107°-114° (4700T PSG) Theoretical; 103° - 109° actual, 99°-102° (2900 MWS), 107°-115° (4700 MWS)
    a.i. effected by the operating pressure, flow rate and the surface impact being sprayed.
    → Theoretical total impact = 0,0324 · flow rate (l/min) · sqrt(operating pressure [kg/cm^2]) ≈ 850,862266 (kg/cm^2)
    → Total impact efficiency 30 cm from nozzle: 45% - 50%
    → Actual impact = total impact efficiency * theoretical total impact ≈ 382,89 – 425,43 (kg/cm^2)
5) **Working fluid:** Pure? water
6) **Quality of atomization:** Fog (optimal) 1 - 30 microns, mist (good) 30 – 100 microns
    a.i. For a given nozzle, the quality of atomisation may be improved by increasing pressure. As an approximate rule of thumb, droplet diameters for hydraulic nozzles may be assumed to vary as the -0.3 power of pressure. However, the exact effect depends on the nozzle design and operating conditions. At very high pressures, a further increase often has a negligible effect on atomisation. The two most important liquid properties that affect atomisation are viscosity and surface tension.
    → $\sigma_{s@100\,°C} = 0{,}05891$ N/m (EES)
    a.ii. Droplet size varies through out the spray; largest drops near the outside of cone.
7) **Material:** 316L(haponkestävä), proto 304(rosteri), anodisoitu alumiini?
8) **Durability:** Suuttimen ”ahdettu osa” voimakasta kulutusta/eroosiota kestävästä materiaalista: wolframikarbidi??? yms...

Ref. Delavan