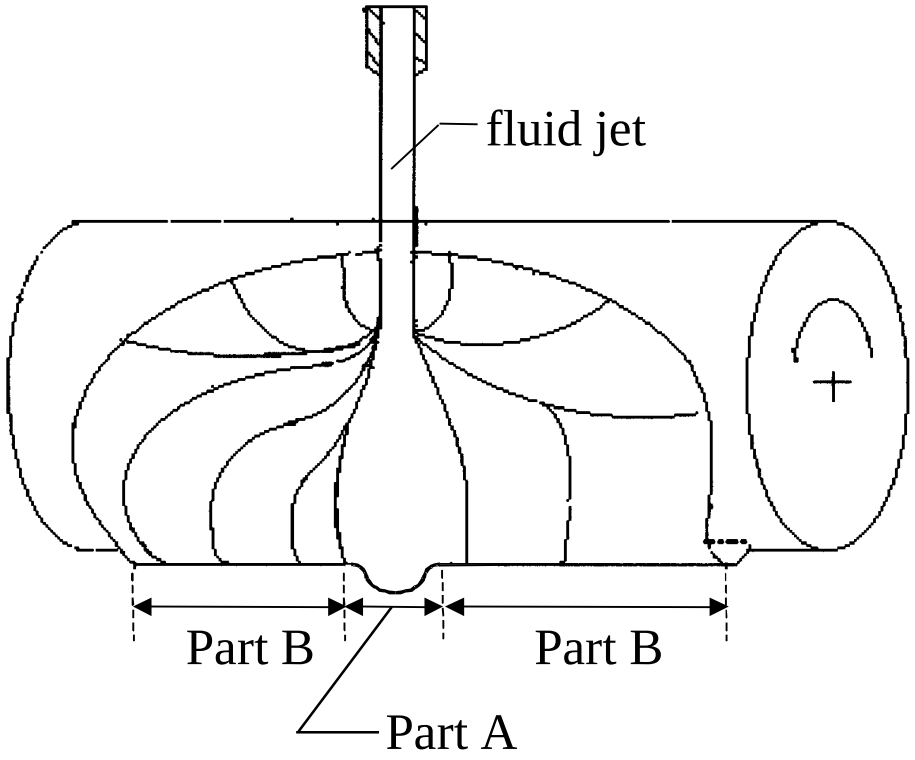
# Scope of Study

Quantitatively describe the generation of cutting fluid aerosol in a turning operation performed on a horizontal lathe in the context of :

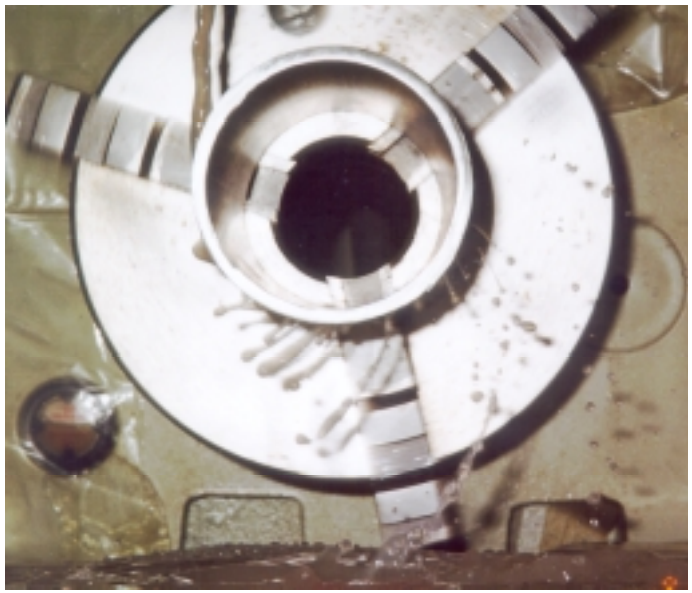
- spin-off
- splash

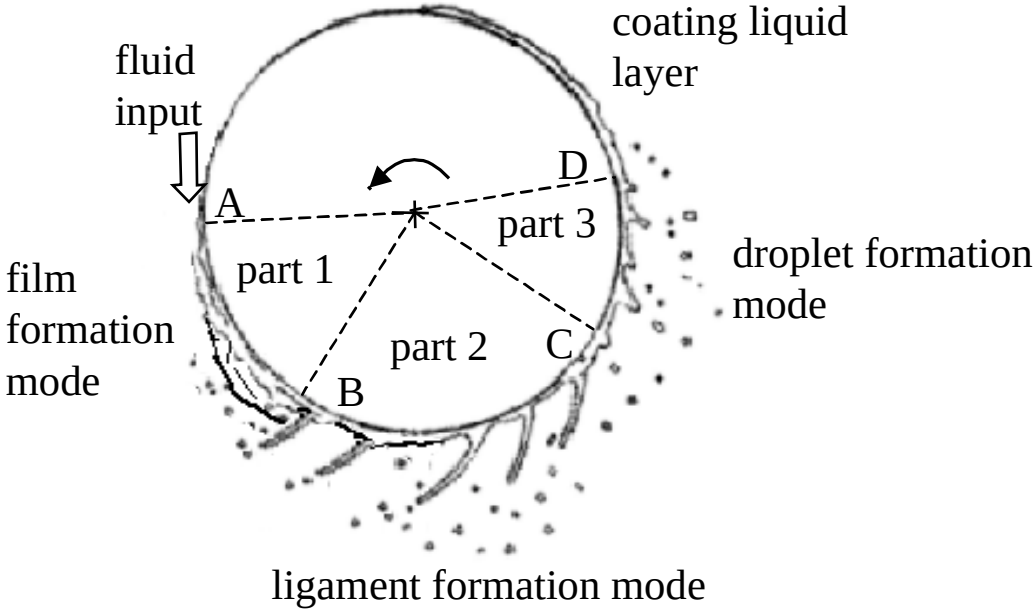
# Spin-off: Complete Process



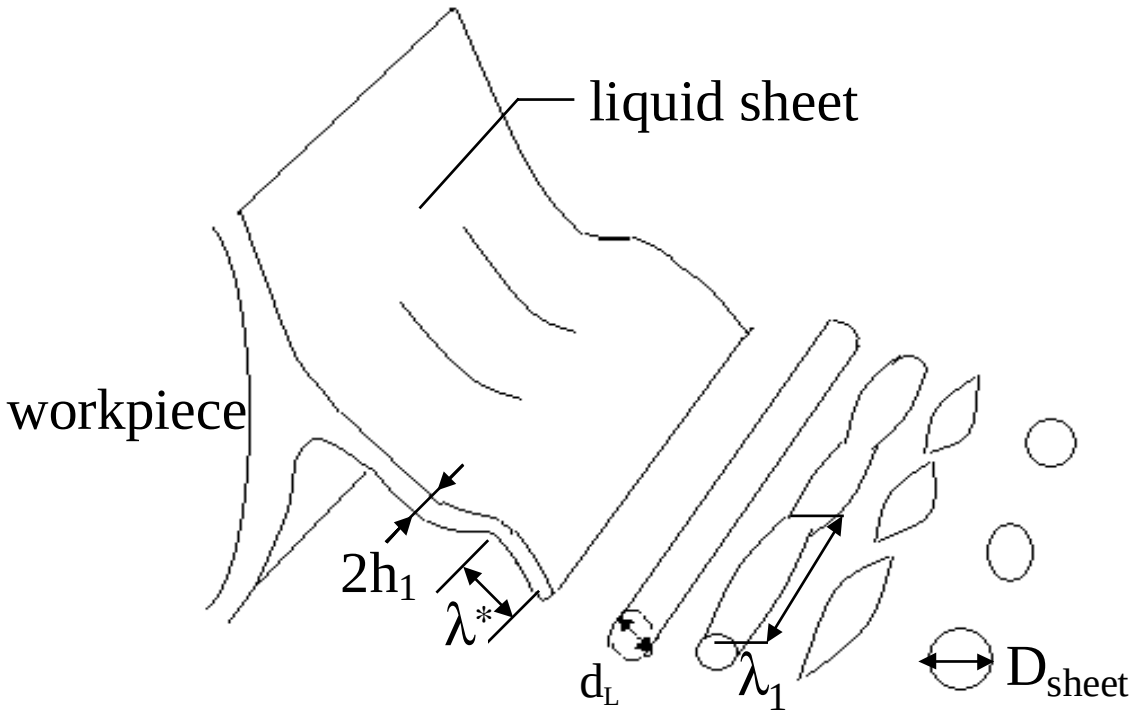

Spin-off mechanism containing a rotary disk part (A) and a liquid sheet part (B)

# Spin-off: Rotary Disk Atomization Model

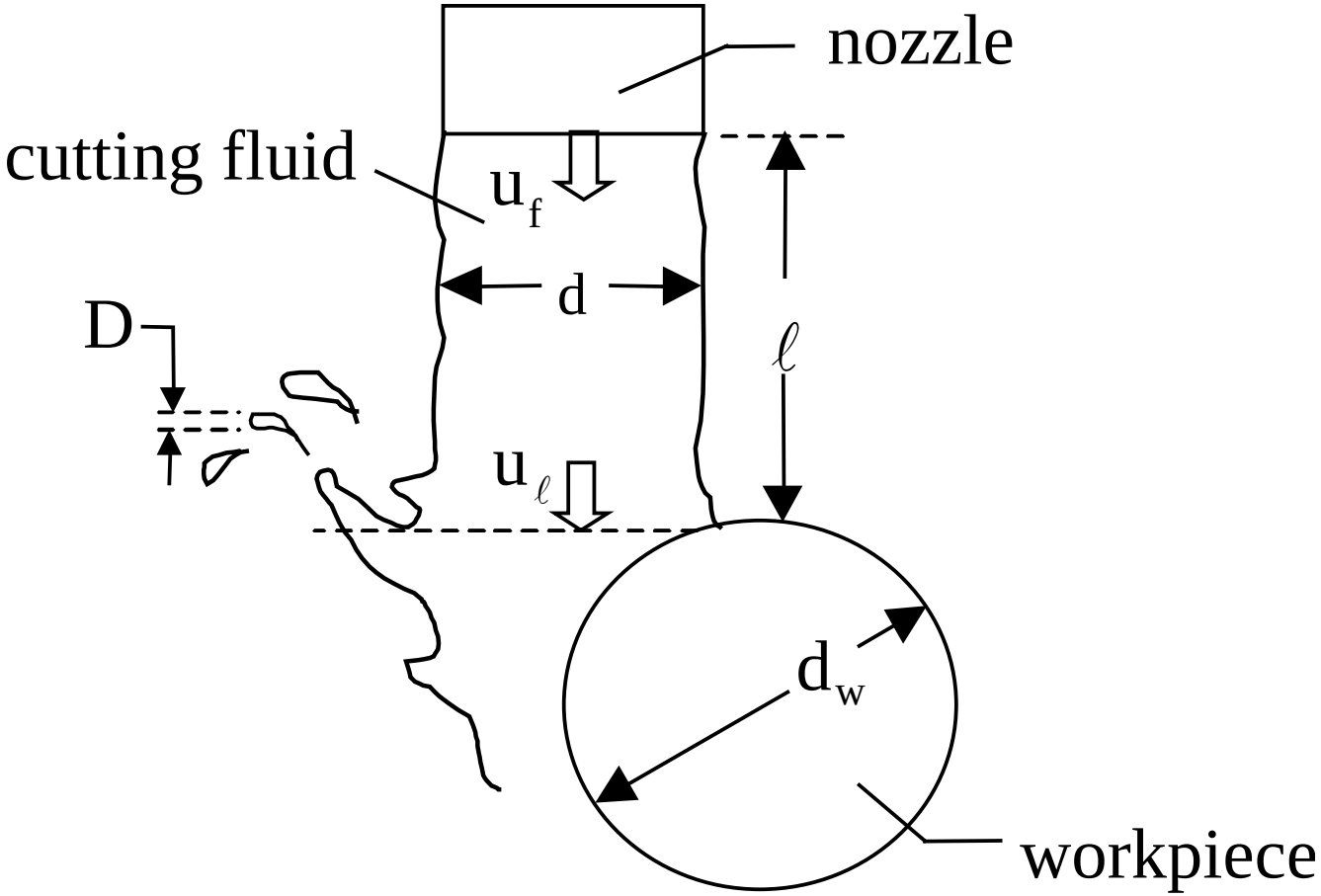




# Spin-off: Liquid Sheet Model



# Splash: Complete Process

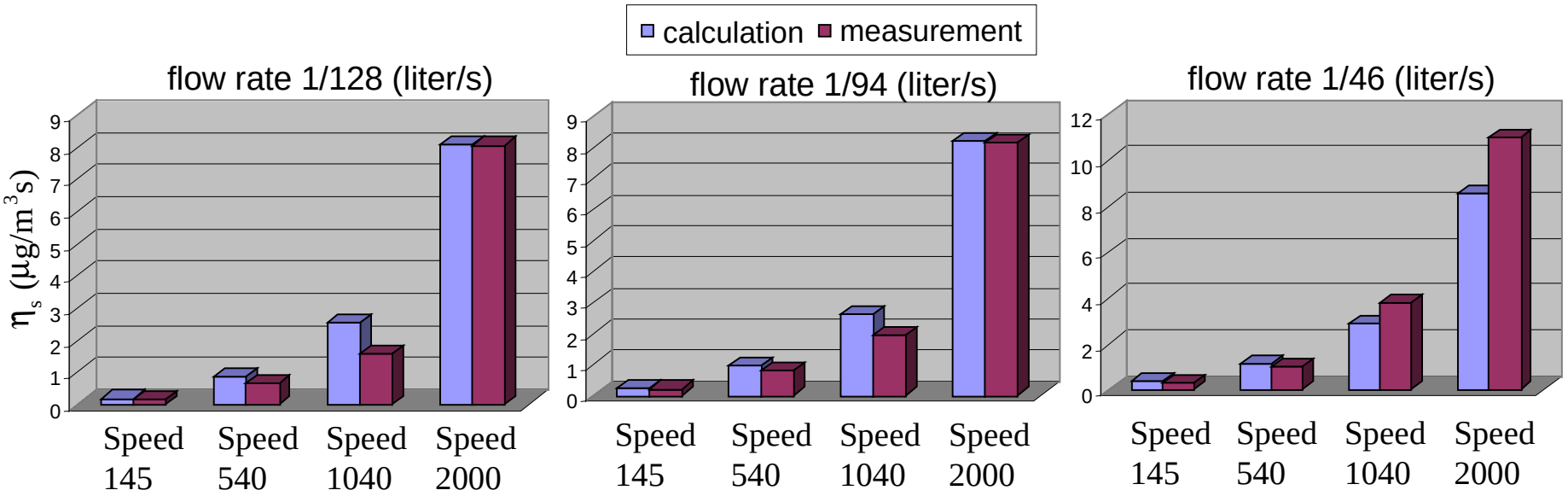


# Aerosol Generation Rate

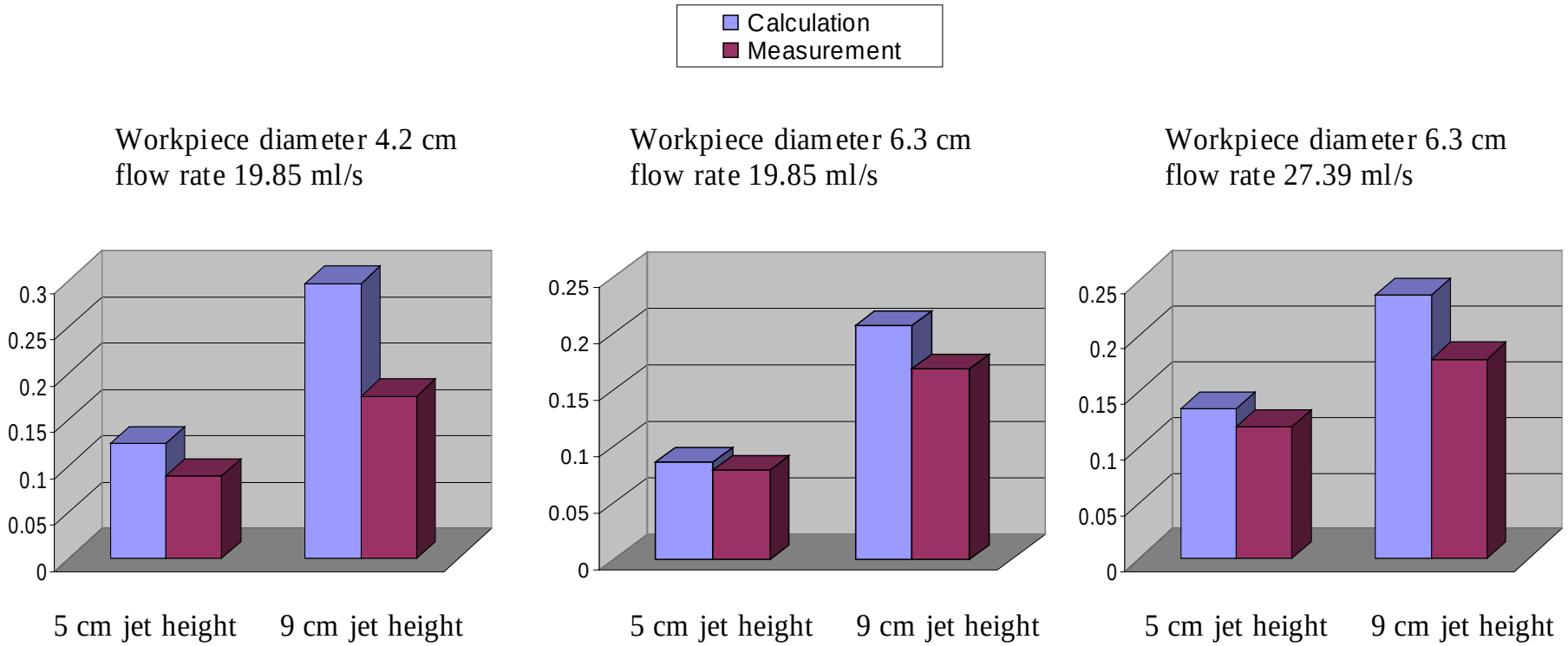
$$\dot{\eta}_{spin-off} = \left(\dot{M}_f \Phi_f(D) + \dot{M}_\ell \Phi_\ell(D) + \dot{M}_d \Phi_d(D) + \dot{M}_s \Phi_s(D)\right)/Vol$$

$$\dot{\eta}_{splash} = \beta \xi \rho u_f \left(\frac{\pi d^2}{4}\right) \Phi_{splash}(D)/Vol$$

# Spin-off: Analytical and Experimental Results of Aerosol Generation Rate



# Splash: Analytical and Experimental Results of Aerosol Generation Rate



# Conclusion

- The aerosol generation rate increases with the increase of :
  - flow rate
  - rotational speed
  - jet distance
- There is a good agreement between the analytical and theoretical results