

Microbubbles

Microbubbles

- Simplified model — try to understand the behaviour of a single bubble in an infinite cylinder.

Microbubbles

- Simplified model — try to understand the behaviour of a single bubble in an infinite cylinder.
- Consider the **Rayleigh - Lamb (Plesset)** model on bubble growth.

- Simplified model — try to understand the behaviour of a single bubble in an infinite cylinder.
- Consider the **Rayleigh - Lamb (Plesset)** model on bubble growth.

Rayleigh - Lamb

$$\frac{p_v - p_\infty}{\rho_l} = \frac{3}{2}\dot{R}^2 + R\ddot{R} + 4\frac{v_l\dot{R}}{R} + 2\frac{\gamma}{\rho_l R}$$

- Simplified model — try to understand the behaviour of a single bubble in an infinite cylinder.
- Consider the **Rayleigh - Lamb (Plesset)** model on bubble growth.

Rayleigh - Lamb

$$\frac{p_v - p_\infty}{\rho_l} = \frac{3}{2}\dot{R}^2 + R\ddot{R} + 4\frac{v_l\dot{R}}{R} + 2\frac{\gamma}{\rho_l R}$$

- This equation only considers the bubble in spherically symmetric fluid.

- Simplified model — try to understand the behaviour of a single bubble in an infinite cylinder.
- Consider the **Rayleigh - Lamb (Plesset)** model on bubble growth.

Rayleigh - Lamb

$$\frac{p_v - p_\infty}{\rho_l} = \frac{3}{2}\dot{R}^2 + R\ddot{R} + 4\frac{v_l\dot{R}}{R} + 2\frac{\gamma}{\rho_l R}$$

- This equation only considers the bubble in spherically symmetric fluid.
- Need to look at adding gravity, buoyancy etc into the model (momentum equation).

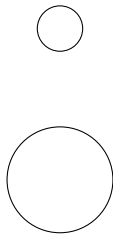
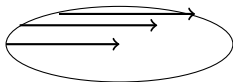
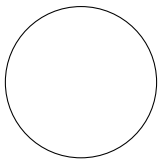
Microbubbles

Microbubbles

- We know bubble break up will not happen without shear force.

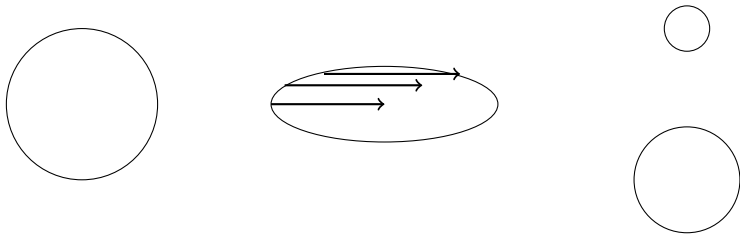
Microbubbles

- We know bubble break up will not happen without shear force.



Microbubbles

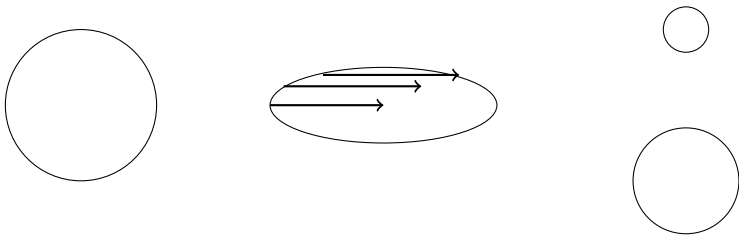
- We know bubble break up will not happen without shear force.



- We have seen that it is not likely that the daughter bubbles are equally sized — we need to assign some distribution of daughter bubbles, within physical bounds.

Microbubbles

- We know bubble break up will not happen without shear force.



- We have seen that it is not likely that the daughter bubbles are equally sized — we need to assign some distribution of daughter bubbles, within physical bounds.
- The break up process only happens for sufficiently large Weber number.

Weber Number

$$We = \frac{\rho v^2 d}{\gamma}$$

Weber Number

$$We = \frac{\rho v^2 d}{\gamma}$$

- Currently, consider the coalescence of bubbles as a negligible mechanism in high flow velocity — break up is dominant.

Weber Number

$$We = \frac{\rho v^2 d}{\gamma}$$

- Currently, consider the coalescence of bubbles as a negligible mechanism in high flow velocity — break up is dominant.
- Model the shear force in the shaking of a cylinder.

Weber Number

$$We = \frac{\rho v^2 d}{\gamma}$$

- Currently, consider the coalescence of bubbles as a negligible mechanism in high flow velocity — break up is dominant.
 - Model the shear force in the shaking of a cylinder.
-
- **Aim:**
 - To investigate current approaches in literature of incorporating motion effects into the Rayleigh-Lamb equation.
 - Incorporate these effects in the framework of the shaking container.
 - Determine the probability of coalescence