

Linear momentum - mass system

Reynold's Theorem: the bridge. Mass system to control volume. Lagrang to Eulerian

if $t=t$: $B_{sys}=B_{cv}$, $CV=Sys$, occupy the same space

extensive quantities (B): depend on the size of the region. If $B = m$ then $b = 1$ If $B = \square$
 $\square_v$ then $b = v$

if $t=t+\Delta t$, $B_{sys} \neq B_{cv}$, $CV \neq Sys$, we use Reynolds here.

intensive quantities (b): independent of the size

Flow rate: $Q=Av$, if p is constant $\rightarrow$ mass flow rate

Reynolds formula

final Reynold's transport theorem:

$$\frac{\partial B_{sys}}{\partial t} = \underbrace{\frac{\partial}{\partial t} \int_{CV} \rho b \, dV}_{\text{change in quantity of interest with the CV}} + \underbrace{\int_{CS} \rho b (\vec{V} \cdot \vec{n}) \, dA}_{\text{flow in and out of CV of the quantity interest}}$$

when a moving CV we have w as the relative velocity. $w = v_b - v_{cs1}$

Forces acting on fluids

$$\sum \vec{F}_{cv} = \sum \vec{F}_{body} + \sum \vec{F}_{surface}$$

$\sum \vec{F}_{body} = \int_{CV} \rho \vec{f} \, dV$: Act on each element with the body/fluid, applied to the whole control volume

$\sum \vec{F}_{surface} = \int_{CS} \vec{\sigma} \, dA$: Act on each element on the control surface (stress comes from the balance of linear momentum)

$dP/dt = \sum F_{sys} = \sum F_{cv}$, where
 $P = mv$: momentum

How to set up a cv problem

whats happening, whats gonna cause. What are we trying to solve.

To draw CV: we think of where you bisects-cut into 2 parts

In volume: be within the boundaries of CV. Area integral: must bisect the boundary-s/surface of CV

Accumulation? In which integral are we looking. Does the quality act on the surface. Align the flow with dirt vector,

mass vs linear momentum

Balance of Mass:	Balance of Linear
Finding flow rates, the relationship velocities and areas.	Momentum: Finding relatshs btnw flow properties and forces. Vector. (-
Scalar. (-/+)	/+) from scalar
from scalar product	product or direct of vector quantities
B of mass in B of linear momentum problems to find unknown.	



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