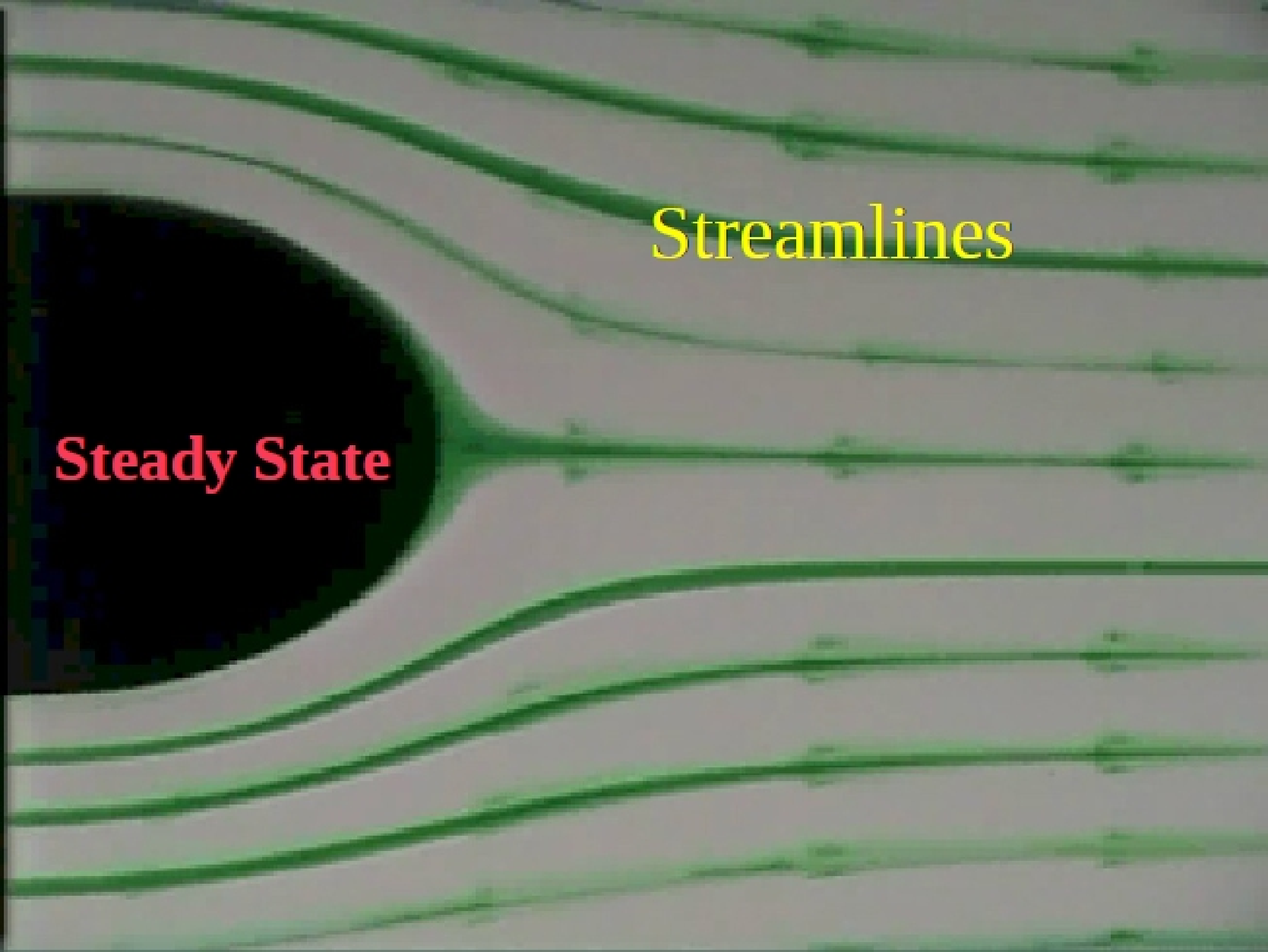


Elementary Fluid Dynamics: The Bernoulli Equation

CVEN 311 Fluid Dynamics



Streamlines

A diagram illustrating streamlines in a steady state flow. The flow is represented by a series of green lines with arrows pointing from left to right. On the left, a dark, curved object is shown. The streamlines curve around this object, following its contour. The flow is smooth and continuous, indicating a steady state. The streamlines are more densely packed in some areas and more spread out in others, suggesting variations in flow velocity.

Steady State

Bernoulli Along a Streamline

$$-\frac{dp}{\rho} = r a + g \hat{k} \quad (\text{eqn 2.2})$$

$$-\frac{dp}{\rho} = r a_s + g \left(\frac{dz}{ds} \right)$$

Separate acceleration due to gravity. Coordinate system may be in any orientation!

Component of g in s direction

Note: No shear forces!
Therefore flow must be frictionless.

Steady state (no change in p wrt time)

