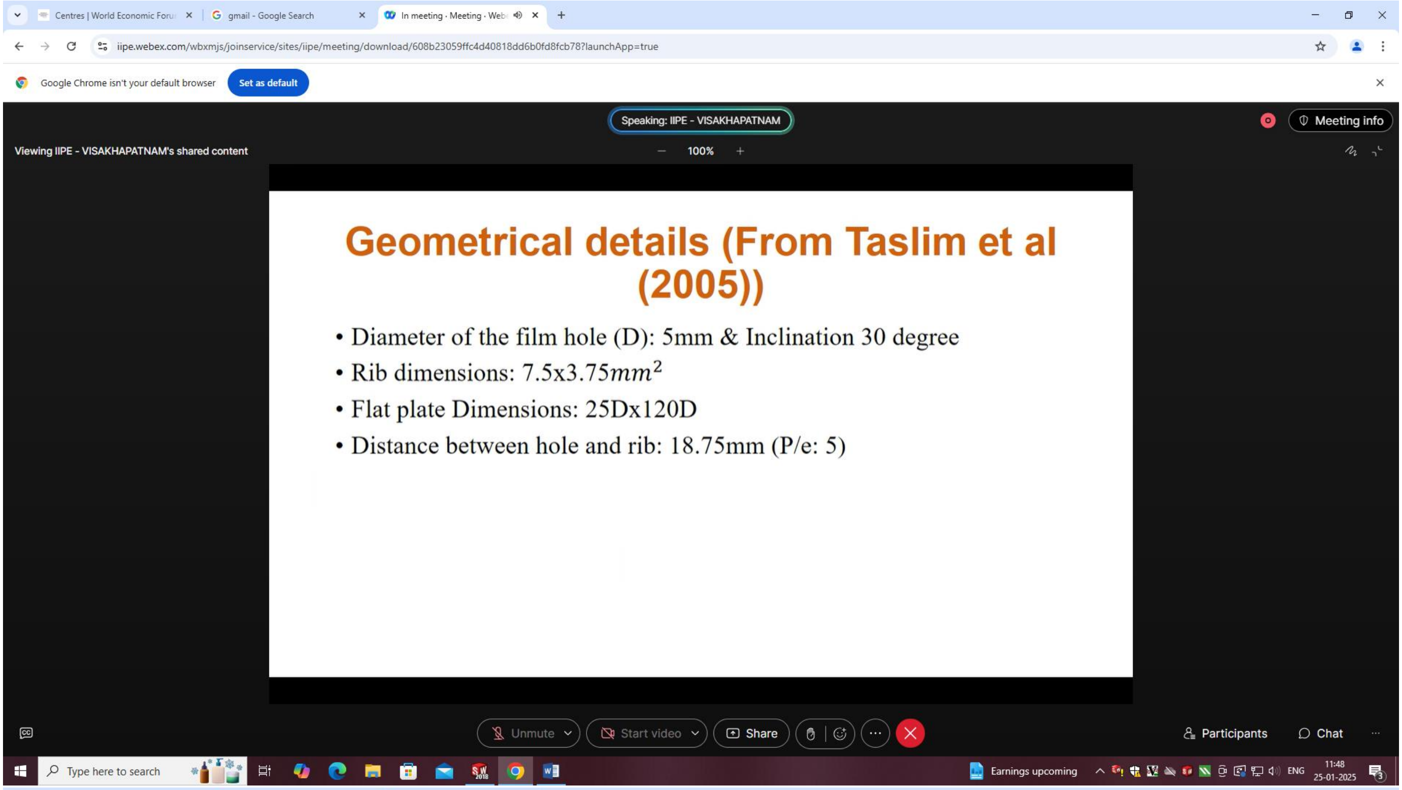
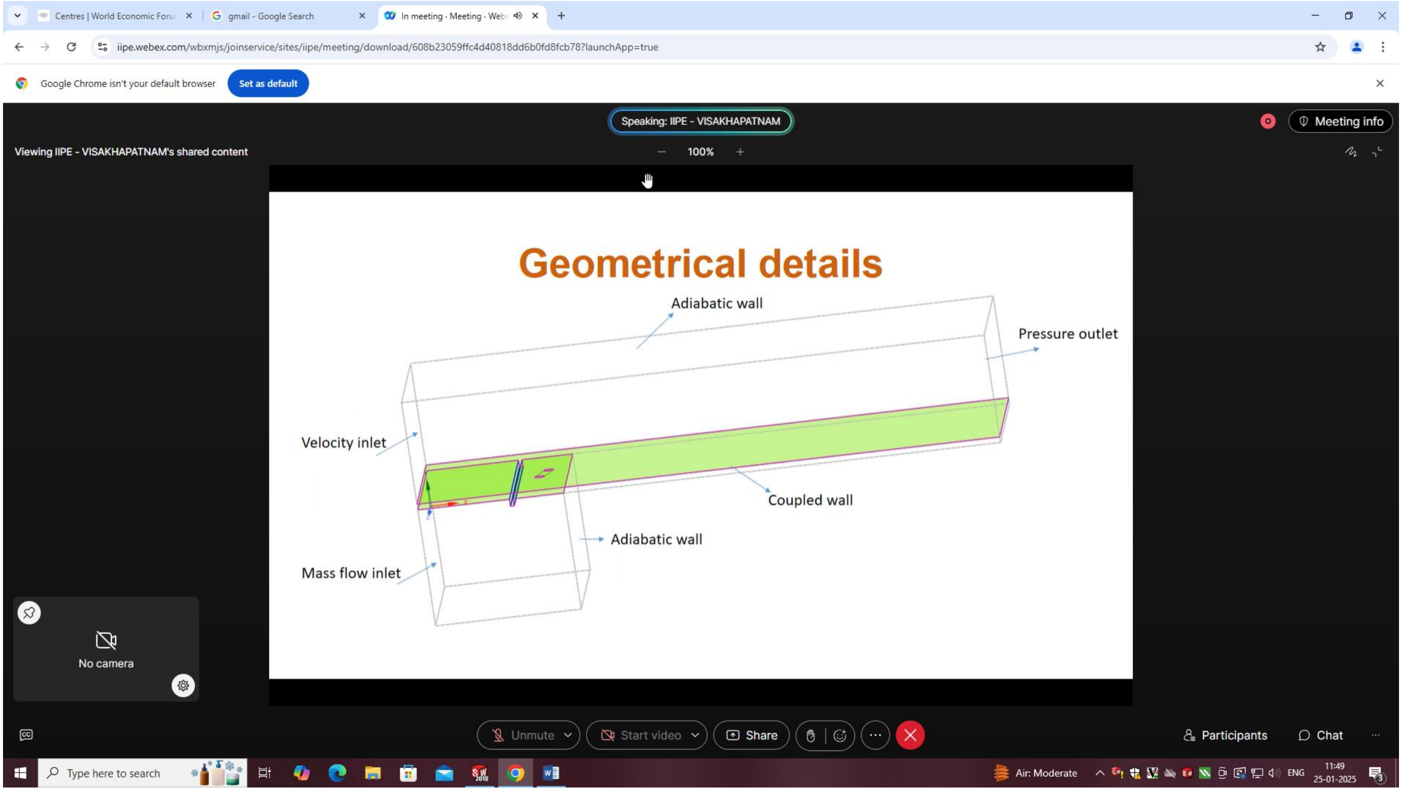
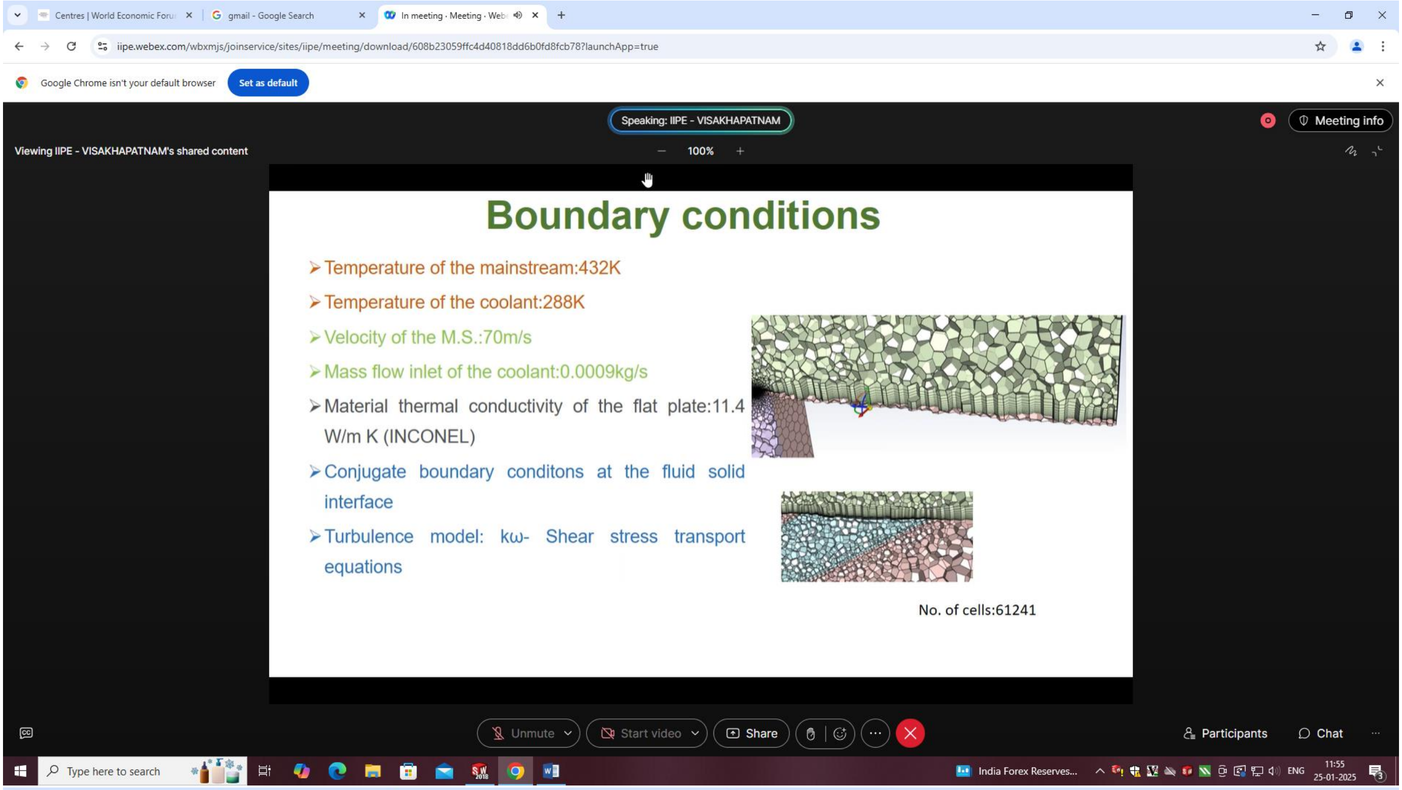

Speaking: IIPE - VISAKHAPATNAM
Viewing IIPE - VISAKHAPATNAM's shared content
Geometrical details (From Taslim et al (2005))
• Diameter of the film hole (D): 5mm & Inclination 30 degree
• Rib dimensions: 7.5x3.75mm^2
• Flat plate Dimensions: 25Dx120D
• Distance between hole and rib: 18.75mm (P/e: 5)


Speaking: IIPE - VISAKHAPATNAM
Viewing IIPE - VISAKHAPATNAM's shared content
Geometrical details
Adiabatic wall
Pressure outlet
Velocity inlet
Coupled wall
Adiabatic wall
Mass flow inlet
No camera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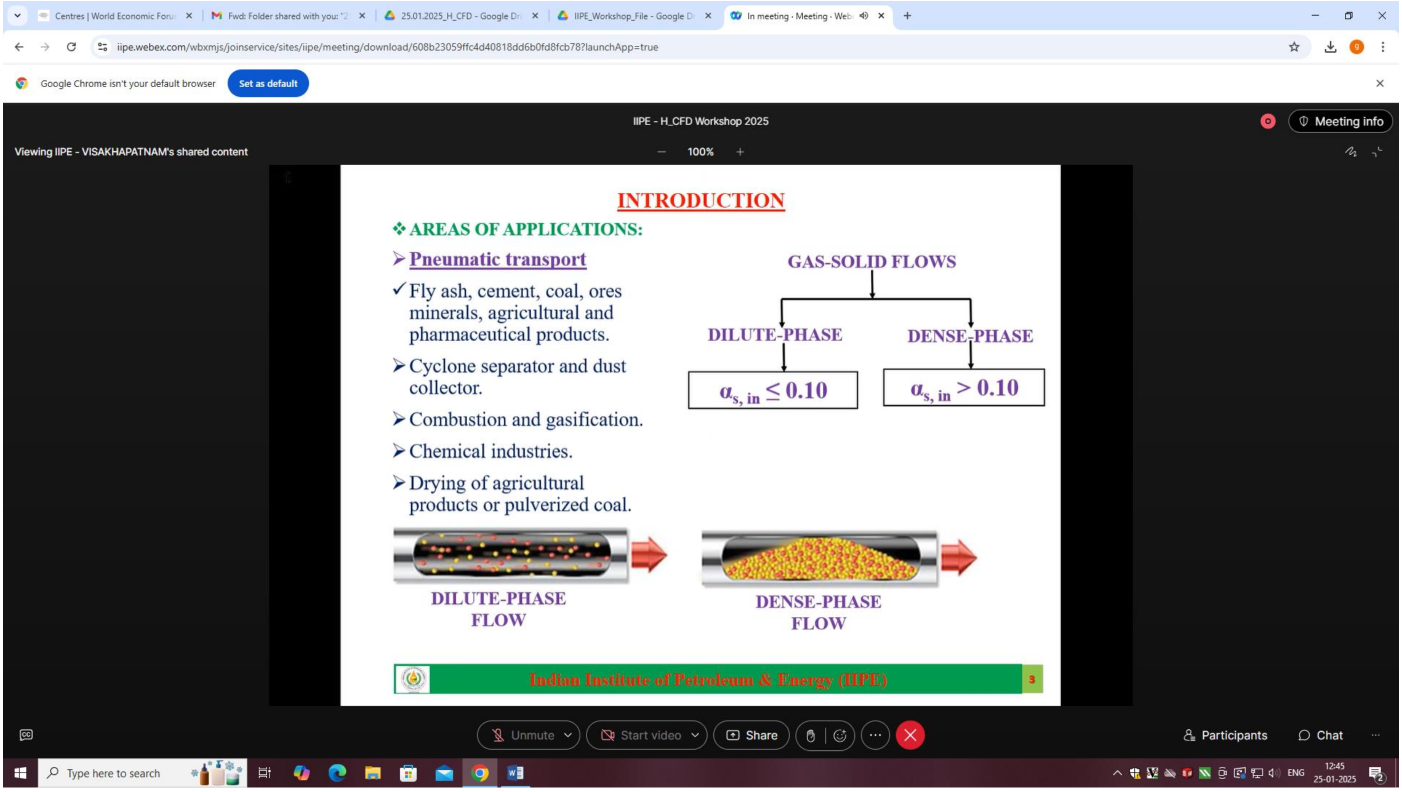
Boundary conditions
Temperature of the mainstream:432K
Temperature of the coolant:288K
Velocity of the M.S.:70m/s
Mass flow inlet of the coolant:0.0009kg/s
Material thermal conductivity of the flat plate:11.4 W/m K (INCONEL)
Conjugate boundary conditons at the fluid solid interface
Turbulence model: kω- Shear stress transport equations
No. of cells:61241


IIPE - H_CFD Workshop 2025
Viewing IIPE - VISAKHAPATNAM's shared content
INTRODUCTION
AREAS OF APPLICATIONS:
Pneumatic transport
Fly ash, cement, coal, ores minerals, agricultural and pharmaceutical products.
Cyclone separator and dust collector.
Combustion and gasification.
Chemical industries.
Drying of agricultural products or pulverized coal.
GAS-SOLID FLOWS
DILUTE-PHASE
DENSE-PHASE
$\alpha_{s,\,in} \leq 0.10$
$\alpha_{s,\,in} > 0.10$
DILUTE-PHASE FLOW
DENSE-PHASE FLOW
Indian Institute of Petroleum & Energy (IIPE)
3

BASIC TERMINOLOGIES IN GAS-SOLID FLOW

- THE SOLID LOADING RATIO

$$\beta = \frac{\dot{m}_s}{\dot{m}_g} \qquad \beta = \frac{\alpha_s \rho_s U_{s,in} A_{in}}{(1-\alpha_s)\rho_g U_{g,in} A_{in}}$$

- THE VOLUME FRACTION OF THE SOLID-PHASE

$$\alpha_s = \frac{V_s}{V} = \frac{V_s}{(V_s + V_g)} = \frac{NV_p}{V} = \frac{N\left(\frac{\pi d_p^3}{6}\right)}{V} \qquad V_s = NV_p \qquad V_p = \frac{\pi d_p^3}{6}$$

- THE VOLUME FRACTION OF THE GAS-PHASE

$$\alpha_g = 1 - \alpha_s$$

- SUPERFICIAL VELOCITY OF THE PHASES

$$U_{g,in} = \frac{Q_{g,in}}{A_{in}} \qquad U_{s,in} = \frac{Q_{s,in}}{A_{in}}$$

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- THE SLIP VELOCITY BETWEEN THE PHASES AND THE SLIP RATIO

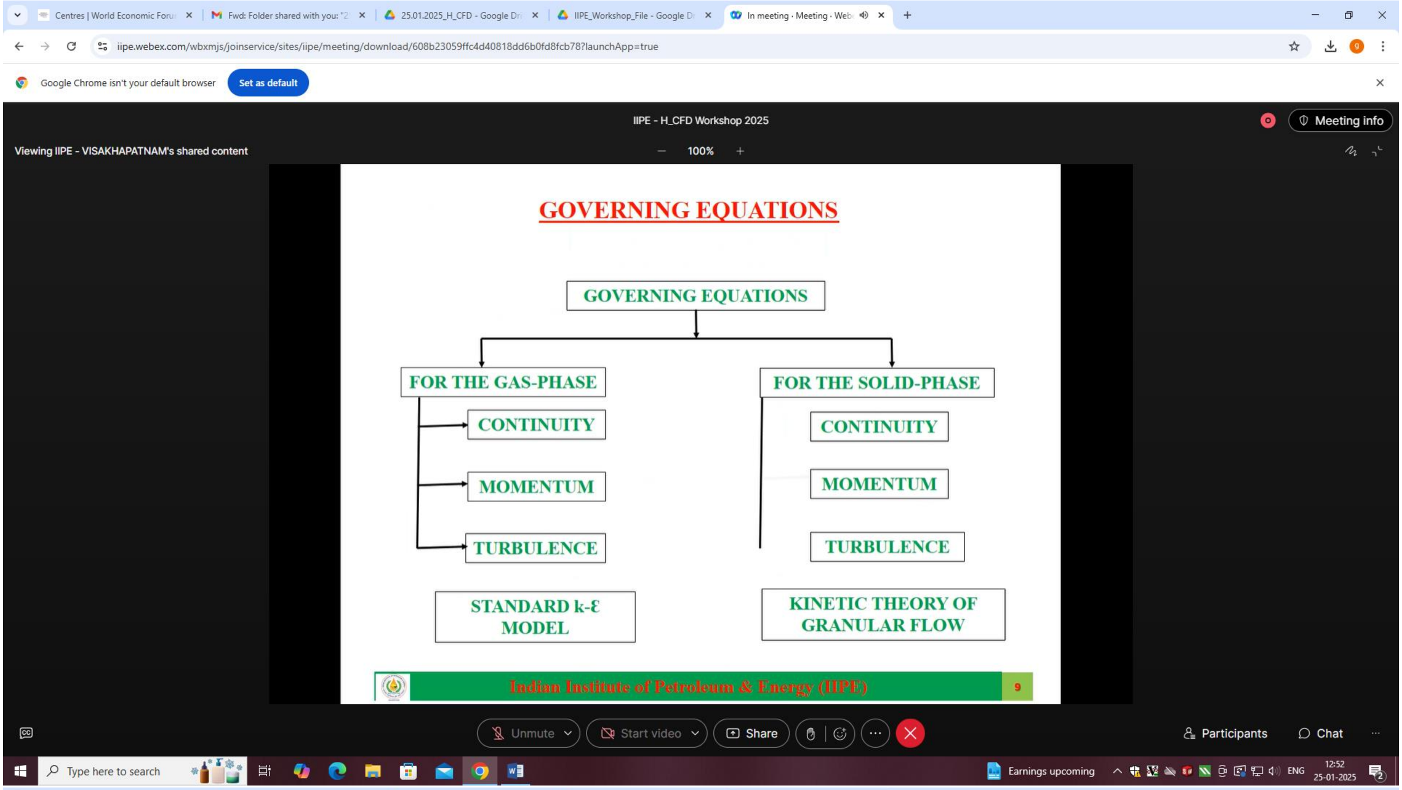
$$U_{gs} = \left|U_g - U_s\right| \qquad SR = \frac{U_s}{U_g}$$

- THE PARTICLE REYNLDS NUMBER

$$\mathrm{Re}_p = \frac{\rho_g \left|U_g - U_s\right| d_p}{\mu_g}$$

- THE STKOKES NUMBER

$$St = \frac{\tau_p}{\tau_f} \qquad \tau_p = \frac{\rho_s d_p^2}{18\mu_g} \qquad \tau_f = \frac{D}{U_g}$$


IIPE - H_CFD Workshop 2025
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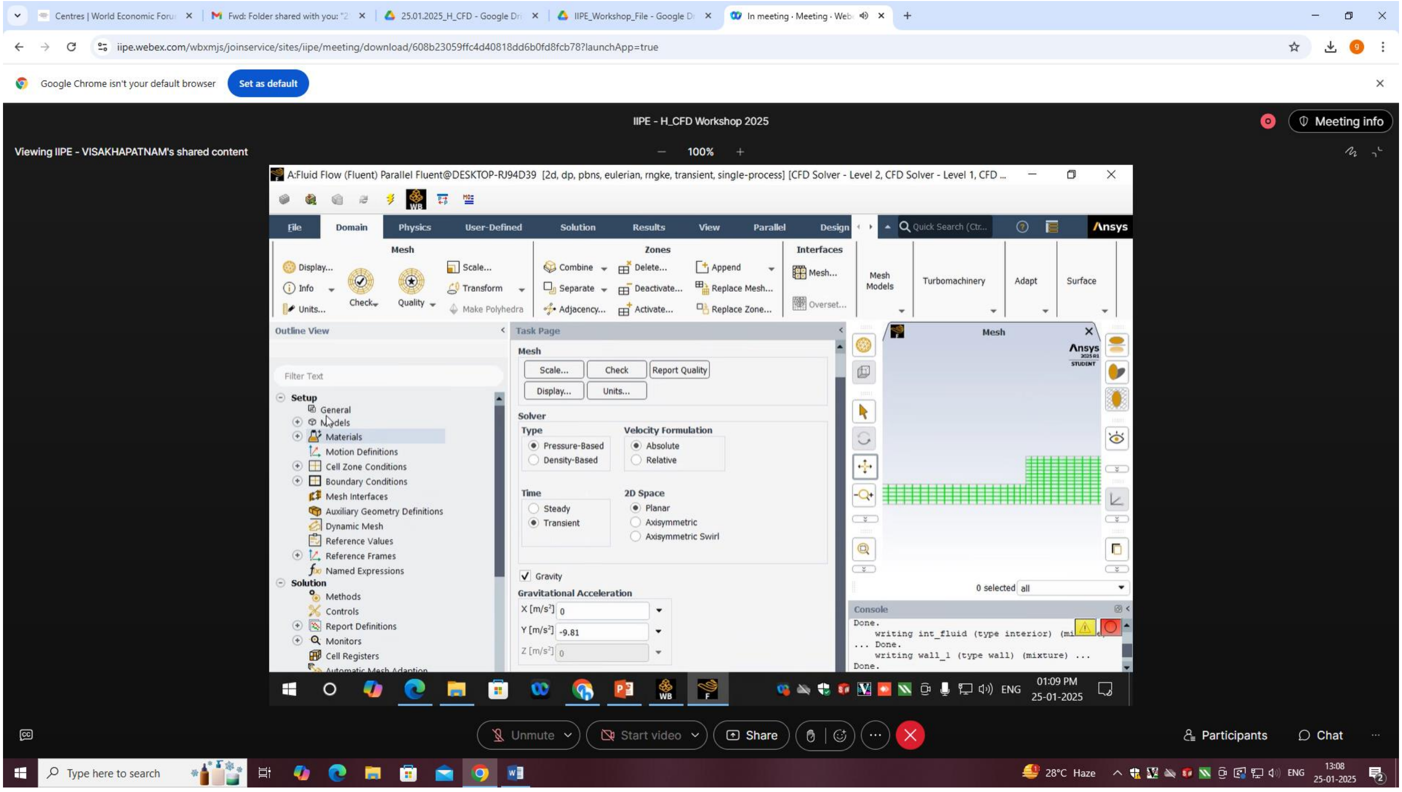
GOVERNING EQUATIONS
GOVERNING EQUATIONS
FOR THE GAS-PHASE
CONTINUITY
MOMENTUM
TURBULENCE
STANDARD k-Ɛ MODEL
FOR THE SOLID-PHASE
CONTINUITY
MOMENTUM
TURBULENCE
KINETIC THEORY OF GRANULAR FLOW
Indian Institute of Petroleum & Energy (IIPE)
9
Unmute
Start video
Share
Participants
Chat
12:52
25-01-2025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A:Fluid Flow (Fluent) Parallel Fluent@DESKTOP-RJ94D39 [2d, dp, pbns, eulerian, rngke, transient, single-process] [CFD Solver - Level 2, CFD Solver - Level 1, CFD ...
File
Domain
Physics
User-Defined
Solution
Results
View
Parallel
Design
Outline View
Setup
General
Models
Materials
Motion Definitions
Cell Zone Conditions
Boundary Conditions
Mesh Interfaces
Auxiliary Geometry Definitions
Dynamic Mesh
Reference Values
Reference Frames
Named Expressions
Solution
Methods
Controls
Report Definitions
Monitors
Cell Registers
Task Page
Mesh
Scale...
Check
Report Quality
Display...
Units...
Solver
Type
Pressure-Based
Density-Based
Velocity Formulation
Absolute
Relative
Time
Steady
Transient
2D Space
Planar
Axisymmetric
Axisymmetric Swirl
Gravity
Gravitational Acceleration
X [m/s²] 0
Y [m/s²] -9.81
Console
Done.
writing int_fluid (type interior)
... Done.
writing wall_1 (type wall) (mixture) ...
Done.
01:09 PM
25-01-2025
Unmute
Start video
Share
Participants
Chat
13:08
25-01-2025