Formula 1

Content placeholder

Formula 2

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Formula 3

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Detailed Explanation

Two-phase flow regime maps are foundational in multiphase flow analysis, enabling engineers to anticipate pressure drop, heat/mass transfer efficiency, flow stability, and equipment sizing requirements. The Baker map (1958), one of the earliest, uses liquid and gas viscosity–density ratios and superficial velocity ratios plotted on logarithmic axes, with region boundaries derived from experimental observations in vertical and horizontal pipes. The Taitel–Dukler map (1976) advances this by incorporating flow stability theory—distinguishing between stable and unstable regimes (e.g., stratified–smooth vs. stratified–wavy) using criteria for wave inception and transition, and is widely applied for horizontal flows. The Mandhane map (1974), built from a large database of air–water and air–oil experiments, offers empirically refined boundaries for vertical and horizontal flows and is particularly valued for its statistical robustness and inclusion of high-viscosity liquids. Modern implementations often integrate these maps into simulation software (e.g., OLGA, Pipesim) and use them alongside drift-flux or mechanistic models to initialize transient simulations or validate CFD predictions.

Key Components

#	Component

1	Superficial gas and liquid velocities
2	Dimensionless property groups (e.g., Froude, Reynolds, Weber numbers)
3	Regime boundary correlations and transition criteria

Applications

#	Application
1	Design and troubleshooting of oil–gas pipelines
2	Sizing of separators and slug catchers in upstream production facilities
3	Optimization of heat exchangers and chemical reactors involving boiling or condensation

Related Concepts

#	Concept
1	Drift-flux model
2	Interfacial area concentration
3	Pressure drop prediction in multiphase flow

Tags

> multiphase flow, flow regime identification, process engineering

Two-Phase Flow Regime Map Poster (Baker, Taitel-Dukler, Mandhane)