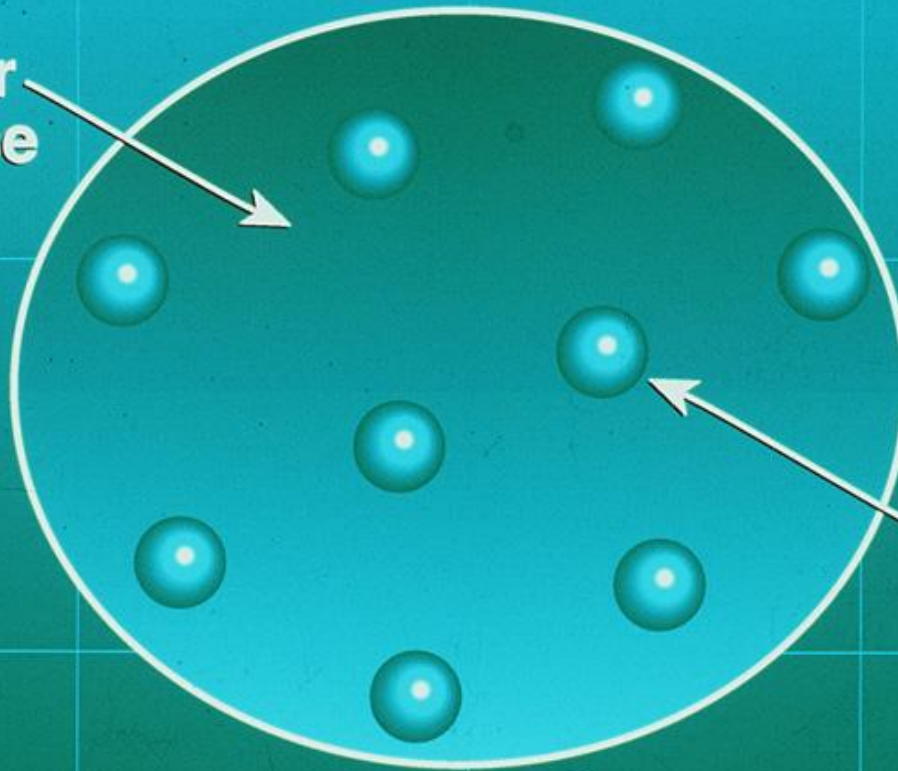


Emulsions

- Multiple phases that do not separate quickly; usually requires an energy source.
- If oil and water do not separate quickly, then look for the stabilizing mechanism
- Emulsions are frequently blamed for damage, however, most emulsions are formed in the tubing or lift system by gas breakout or added energy.

Emulsion Parts

**Continuous or
External Phase**



**Droplets or
Bubbles are
Discontinuous
or Internal
Phase**

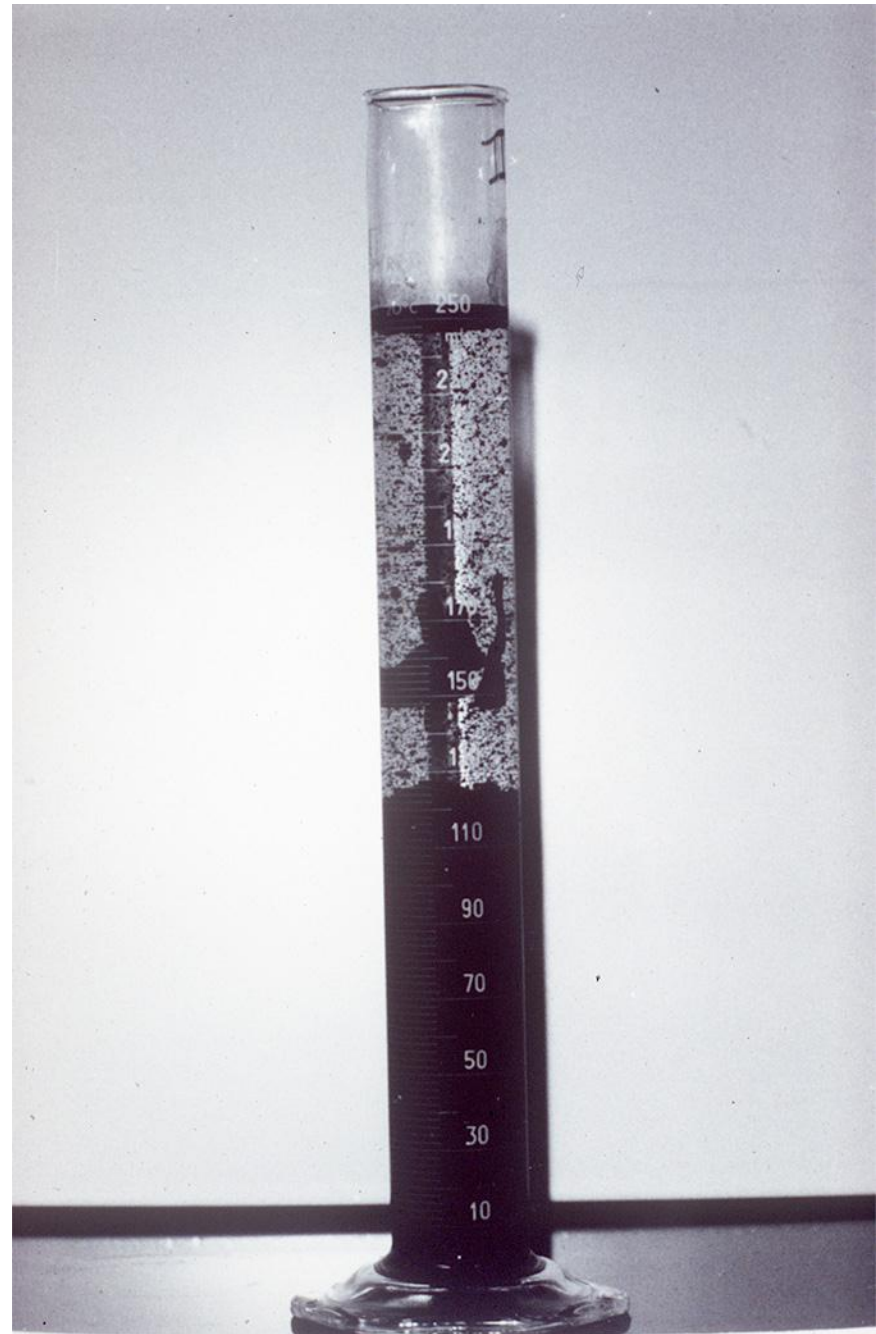
Types of Emulsions

- oil-in-water
 - water-in-oil
 - gas-in-water (foams and froths)
 - solids-in-liquids (muds, etc.)
-
- Over twenty different combinations that can be called emulsions.

Among the worst - Asphaltic Sludges

- Form very viscous masses, often after contact with spent acid; frequently catalyzed by iron
- Sludges are serious problems because they cannot be easily removed.
- Test the oil with spent acid and 1000 ppm iron before acidizing any oil reservoir.

Oil based mud cleanup is a special case, requiring dispersal of the OBM emulsifying agents and wetting of the particles to prevent damage. Contact with acid, as shown, will produce some severe sludges that are very difficult to break.



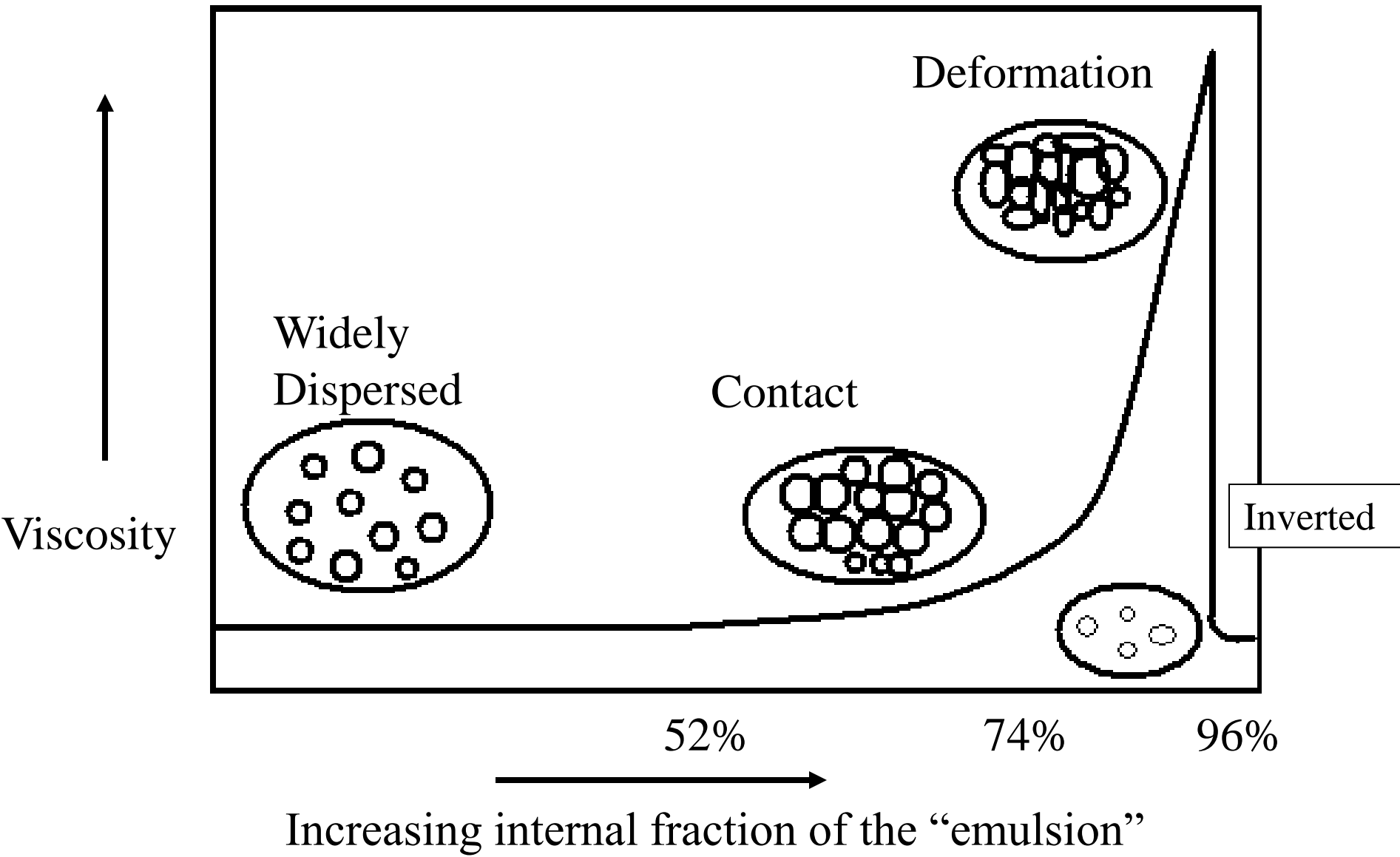
A 50-50 mix of 14 ppg OBM and 15% HCl. The resultant sludge formed immediately and was stable for months.



Stabilizers

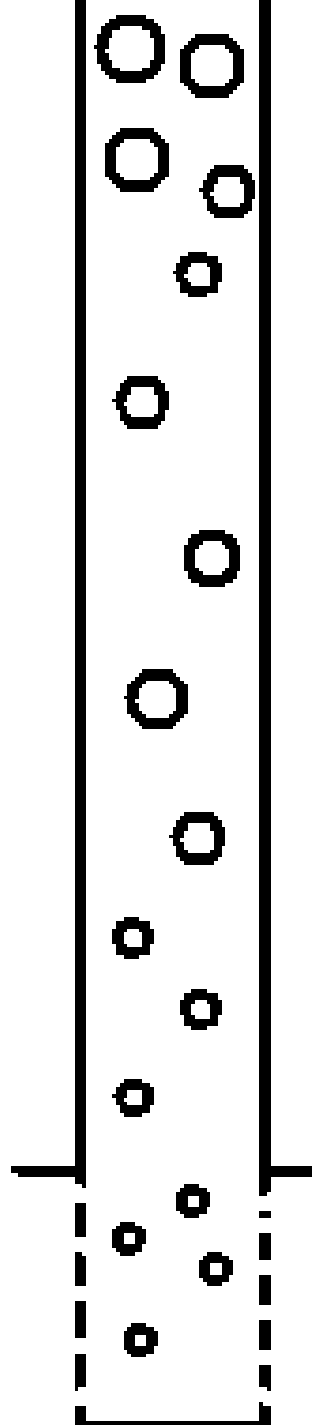
- surfactant (film stiffeners)
- solids (silt, rust, wax, scale, cuttings)
- emulsion or component viscosity (prevents particle or droplet contact)
- Electrical charge (minor influence in most cases).

Changes in Fluid Viscosity with Change in Internal Phase of Dispersed or Emulsified Flow

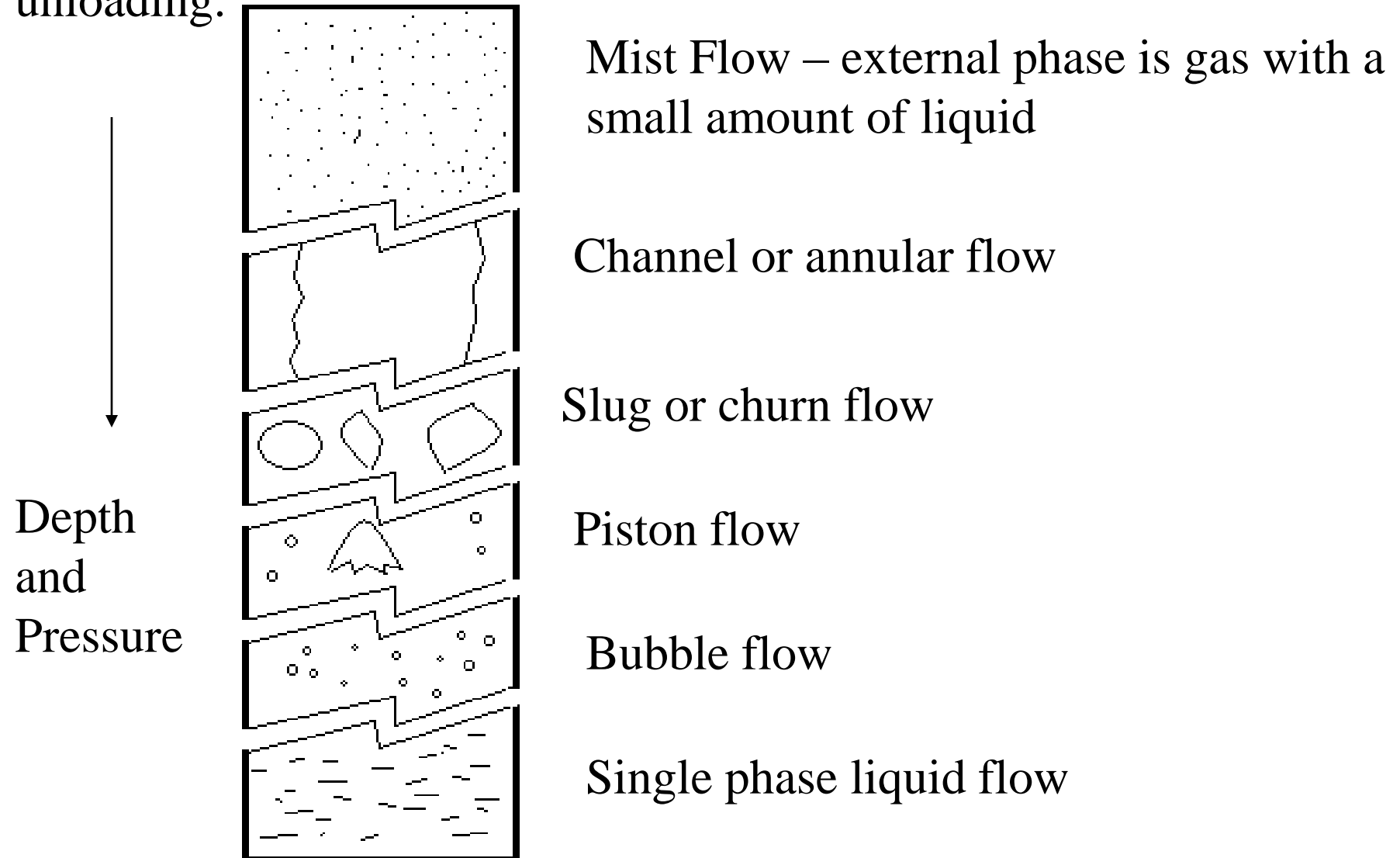


Energy Sources

- lift system
- gas breakout
- shear at any point in the well
- choke
- gas expansion

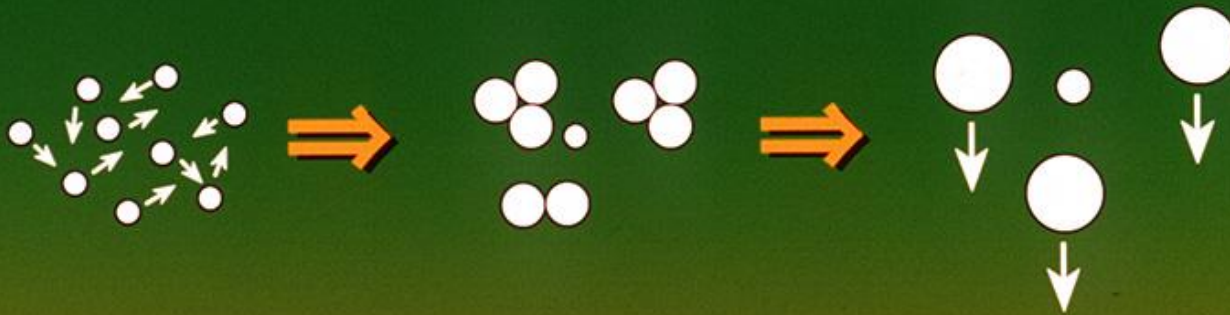


The type of flow pattern changes with the expansion of the gas. One or more of the flow patterns may be present in different parts of the well. The flow patterns may explain differences in lift, corrosion and unloading.



Coalescence

≡ **The joining of droplets to make larger drops**



Larger drops separate faster