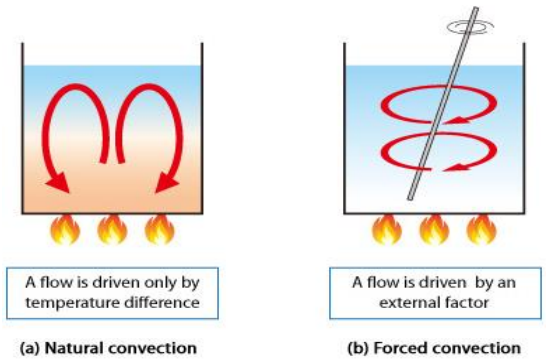
Forced convection is a heat transfer process where fluid motion is generated by an external force, such as a fan or pump. This external force enhances the heat transfer rate between a solid surface and the fluid flowing over or around it. Here's a quick overview:

Key Concepts:

1. **Mechanism:** In forced convection, the external force (e.g., a fan or pump) moves the fluid over the surface, increasing the fluid's velocity. This movement reduces the thermal boundary layer thickness near the surface, which improves heat transfer.
2. **Heat Transfer Coefficient (h):** The efficiency of forced convection is often described by the heat transfer coefficient, which depends on the fluid properties, flow characteristics, and surface geometry.
3. **Reynolds Number (Re):** This dimensionless number characterizes the flow regime (laminar, transitional, or turbulent). It affects the convective heat transfer rate. Higher Reynolds numbers typically indicate more turbulent flow, which enhances heat transfer.
4. **Nusselt Number (Nu):** This dimensionless number relates the convective heat transfer to conductive heat transfer. It's used in empirical correlations to determine the heat transfer coefficient.
5. **Applications:** Forced convection is common in various applications, including cooling electronic devices, heating and ventilation systems, and industrial processes where enhanced heat transfer is needed.



(a) Natural convection (b) Forced convection