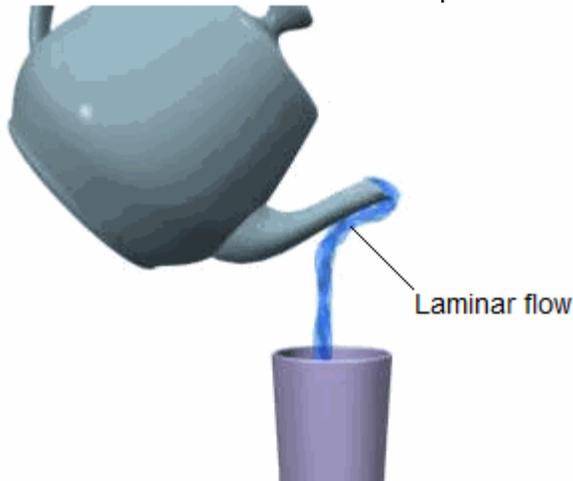


Coanda Effect – Not always a nuisance!

Coanda effect or wall-attachment effect, is the tendency of a moving fluid, either liquid or gas, to attach itself to a surface and flow along it. Physics behind it is complex (not fully understood to-date!) and be explained in another note. But more important are the applications.

1. **Teapot-** It is clearly a nuisance in teapot pouring as shown in videos shown in class. **Full Video shown in class** – be uploaded youtube and shared as very heavy.

Two Videos attached: Storm in a teapot- shown in class.



Conditions:

1. The fluid medium boundary layer must be laminar and characterized by the Reynolds number $Re < / = 2300$. Reynolds number was explained in one earlier note.
2. The streamlined surface must be sufficiently smooth and have a large radius of curvature.
Note: When metal surfaces are polished at $Re < / = 9300$, laminar flow is also preserved.

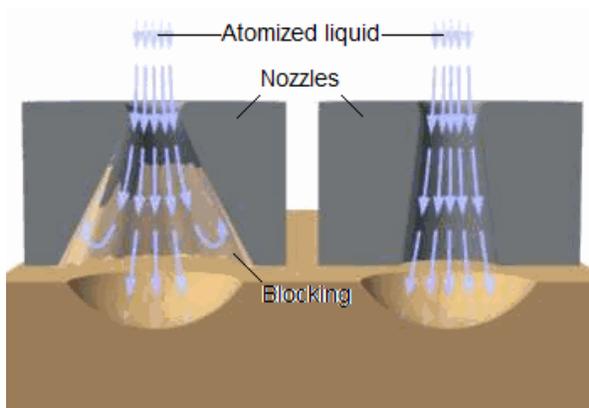
2. **Unclogging Pores:**

Video attached: Unclogging Pores

NOTE THE BLOCKING REMOVED IN RIGHT SIDE PICTURE OF VIDEO.

A drilling head operates due to the fluid fed into it. Operation of drilling machines requires the prevention of clogging of their working elements (drilling heads). Conventional methods of the hydraulic impact type fail to properly clean the drilling head nozzles. Besides, an abrupt rise in pressure of the fluid in pipes might rupture them.

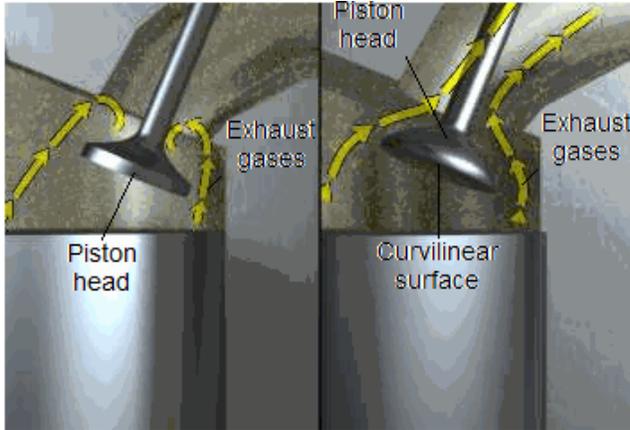
Solution via Coanda Effect: A drilling head nozzle has the shape of a flare. The angle of flare does not exceed 30 degrees. According to the Coanda effect, the fluid flow adheres to the internal nozzle walls. This eliminates blocked zones and prevents the clogging of the drilling head nozzle.



3. Engine Cylinder Wall

Video: Engine Cylinder Wall

NOTE IN VIDEO- THE RIGHT SIDE IMAGE SHOWS COANDA EFFECT ENABLED CYLINDER WHILE LEFT SIDE HAS NO COANDA EFFECT INCORPORATED



In order to reduce aerodynamic drag of the exhaust gas flow in a cylinder valve, **Coanda effect is used** to adhere the gas flow to the curved surface of the valve head.

Reference

US Patent 4 815 706, 03. 28. 89,
Valves for Improved Fluid Flow Therearound
James J. Feulling, USA.

4. Ventilation inside Aircraft

Videos – Two attached- Coanda effect – 1 & 2.

Both show different variants in utilization of this effect.

In variant 1, please observe- fresh air escaping for passengers at two places- above the luggage compartment and below the luggage compartment (just above the passengers).

In variant 2, please observe- fresh air escaping for passengers at one place, viz. above the luggage compartment.

Without needing to go into detailed analysis of fluid flow patterns, *we can notice that Coanda effect enables air to stick to several curvilinear surfaces that are part of aircraft's interior surfaces.*

(Note that these ventilations are distinct from personalized ventilation provided to each passenger (along with reading light and button to request attention of flight staff).