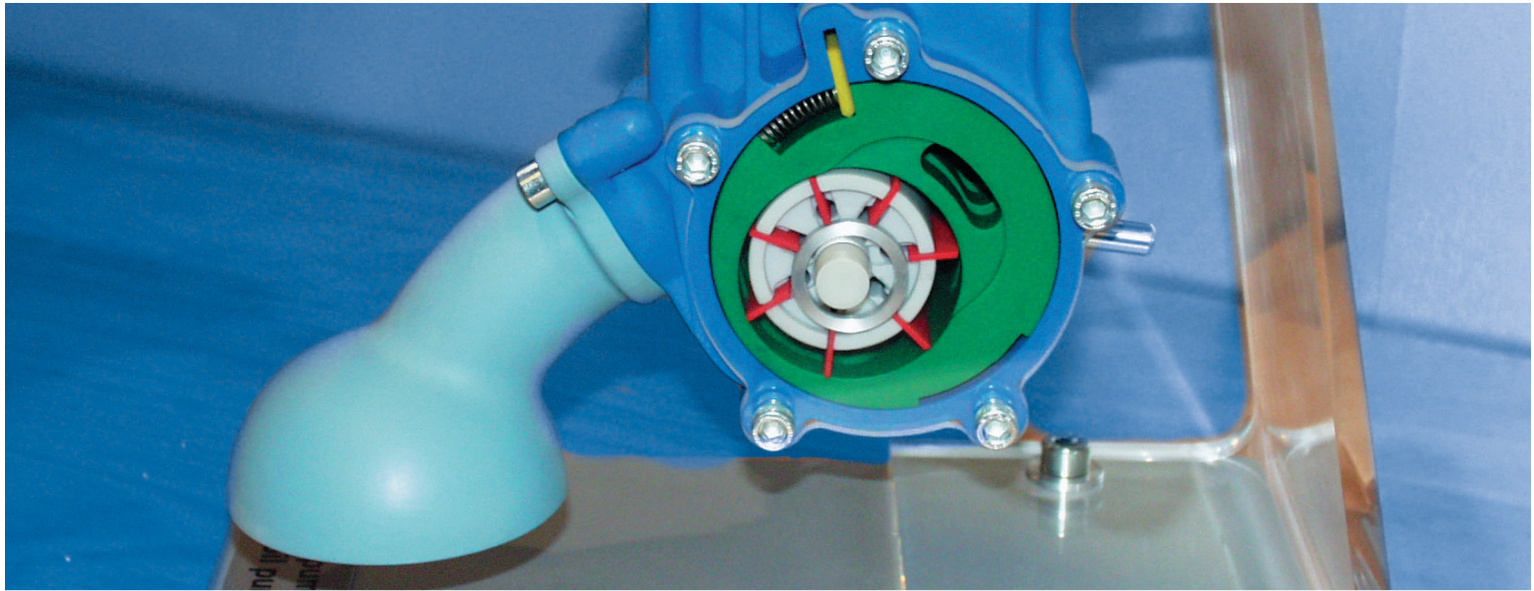


Controlled Vane-Type Oil Pump

For Oil Supply on Demand for Passenger Cars



Current Oil Pump Design

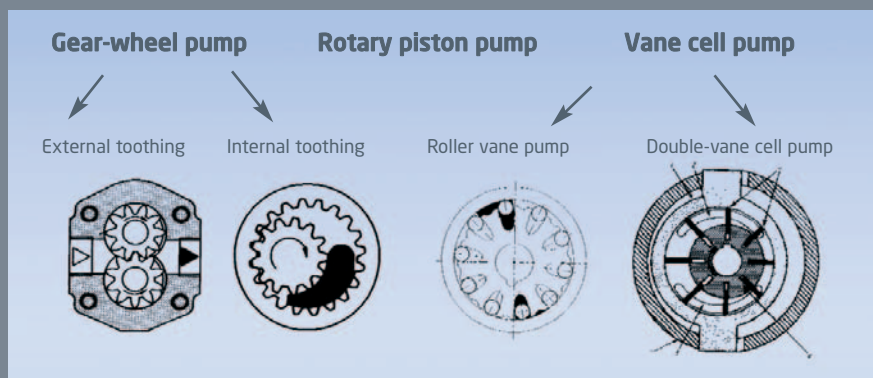
Oil pumps with constant displacement volume that are driven in relation to engine speed are state of the art. For all operating conditions outside of hot idling, the excessive oil must be released by a pressure-regulating valve.

Oil Supply on Demand

The oil demand of a combustion engine is dependent on engine speed, load, part tolerances and operating temperature as well as on the engine's state of wear. Ideally, the oil pump should adapt the delivery volume flow to actual engine oil demand.

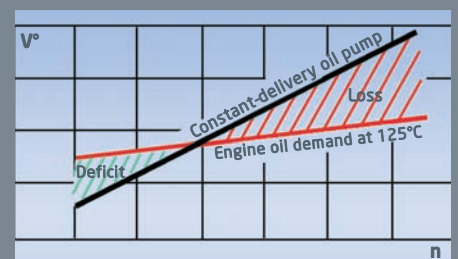
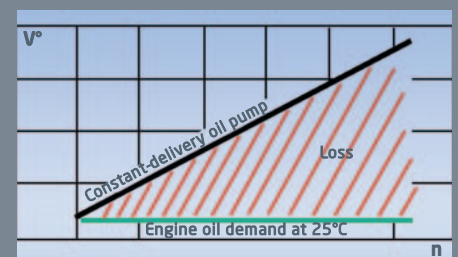
The solution consists in demand-based oil supply using hydraulically controlled or map-controlled oil pumps or in a variation of oil pump speed independently of engine speed.

The following pump designs are suitable for use in internal combustion engines:

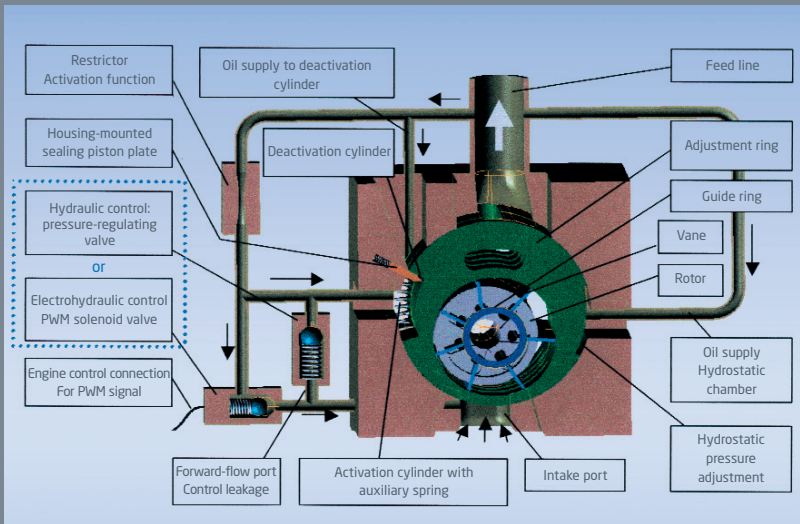


Impact of Delivery Termination on Oil and Engine:

- ▶ Oil stress increases as a result of shear effects, accelerating oil aging
- ▶ Higher gas content in engine oil
- ▶ Increase in oil temperature causes stronger chemical oil aging effects
- ▶ Hydraulic energy is needed to build up pressure for delivery termination quantity



Engine oil demand and delivery characteristic of a constant oil pump



Solutions from IAV

The main development target is to reduce energy loss. The main focus is on avoiding unnecessarily delivered oil which causes increased power loss and oil stress. From the aspect of integration into existing engine concepts, it is necessary to control delivery volume flow on the basis of a variable oil pump displacement volume.

IAV has developed such an oil pump applying the vane-type principle. Vane-type pumps are infinitely variable flow pumps that can vary the flow by adjusting eccentricity. In spite of their small package, they provide a high displacement volume and wide design scope in terms of rotor assembly and adjustment mechanism.

The adjustment of the theoretic delivery volume during the design stage allows higher oil pressure to be achieved in hot idling and improves hydraulically driven functions, such as variable camshaft timing.

As the design does not release volume flow through a pressure-regulating valve, the controlled pump achieves better efficiency over wide engine map areas than controlled constant-delivery oil pumps.