Pressure Carburetors

• The basic engine needs for pressure carburetors are the same as float.

• The primary differences between float and pressure carburetors are:
  – the fuel distribution point is at a different location from the fuel meter, usually after the throttle.
Pressure Carburetors

• The fuel is pressure fed into the airstream, maximizing atomization.
• Fuel is fed into the initial staging area by a pressure pump.
• Typical unmetered fuel pressure is 9 - 14 psi smaller, and 14 - 25 psi on the large multi-bore carburetors
Pressure Carburetors

• Air metering force is created with a pressure differential:
  – Air inlet impact pressure (high)
  – Venturi pressure (low)

• Fuel metering force is that pressure difference felt across the metering jet.
Pressure Carburetors

• This is a dynamic pressure drop created by fuel flowing through a restrictor at varying rates.

• Metered fuel pressure is lower than unmetered fuel pressure when fuel flows through the metering jet.

• Regulating inlet fuel pressure creates accurate fuel metering.
Pressure Carburetors

- Fuel is regulated by a poppet valve that is driven by two pressure differentials:
  - Impact air to venturi air.
  - Unmetered fuel to metered fuel.
- Springs are used to alter these forces.
Pressure Carburetors

• These forces move the poppet valve diaphragms and separate pressure chambers.
• Impact pressure is known A chamber.
• Venturi pressure is B chamber.
• Metered fuel is C chamber.
• Unmetered fuel is D chamber.
Pressure Carburetors

• Fuel inlet pressure is E chamber.
• If A pressure increases and or B pressure decreases the poppet will open more allowing more fuel into D increasing pressure.
• This causes more flow across the metering jet and closes the poppet valve some.
Pressure Carburetors

• As fuel flows across the metering jet, C chamber will unbalance the poppet valve open more.

• Pressure differential across the metering jet and the C/D diaphragm directly regulate fuel quantity delivered to the discharge nozzle, by controlling the poppet valve.
Pressure Carburetors

• Pressure differential across the A/B diaphragm directly monitors air flow into engine and modifies poppet valve action appropriate to the metering jet.

• This allows fuel regulation that is appropriate to the airflow into the engine at differing rates.
Pressure Carburetors

• The nozzle diaphragm valve prevents C chamber pressure from getting low enough to start closing the poppet valve.

• Smaller carburetors use C pressure for metering but not for poppet valve regulation.
  – D balances against A and B
Pressure Carburetors

• The nozzle discharge diaphragm and valve act very similar to a pressure relief valve.

• They will try to maintain C chamber at a constant pressure.

• This will vary by 1/4 to 1/2 PSI depending on engine load.
Pressure Carburetors

• The D chamber poppet valve will attempt to keep a 1/2 PSI pressure differential across the fuel metering jet(s).

• This attempt is modified by differential pressures across A and B chambers.
Pressure Carburetors

E = inlet, D = unmetered, C = metered,
B = venturi air, A = impact air

Mid throttle
Pressure Carburetors

Changes in fuel inlet pressure cause D and C chambers to regulate D pressure.

Mid throttle
Pressure Carburetors

Chamber D low pressure opens poppet

Mid throttle
Pressure Carburetors

Chamber D high pressure closes poppet

Mid throttle
Pressure Carburetors

Returns to equilibrium.

Mid throttle
Pressure Carburetors

Chamber C lower pressure closes poppet until D chamber drops and reopens poppet.

Full throttle
Pressure Carburetors

Chamber C lower pressure closes poppet until D chamber drops and reopens poppet

Full throttle
Pressure Carburetors

Mid throttle

Returns to equilibrium.
Pressure Carburetors

Chamber B low pressure, chamber A high pressure opens poppet

Full throttle
Pressure Carburetors

Chamber B low pressure, chamber A high pressure opens poppet

Full throttle
Pressure Carburetors

Mid throttle

Returns to equilibrium.
Pressure Carburetors

Chamber B increased pressure chamber A decreased pressure closes poppet.

Idle throttle
Pressure Carburetors

D and C chamber then find a new balance.
Pressure Carburetors

Returns to equilibrium.

Mid throttle
Pressure Carburetors

• Inlet impact pressure provides a better throttle response then inlet ambient pressure.

• Air bleed comes from impact air and enters fuel stream in the discharge nozzle.
Pressure Carburetors

• Auxiliary components can include:
  • Accelerator Pump
  • Enrichment / idle control circuits
  • Mixture control circuits
  • Automatic mixture control circuits
  • Separate throttle body/fuel control
Pressure Carburetors

• Accelerator Pump
  – Operates by venturi pressure reacting against a spring.
  – Low MAP draws diaphragm back filling chamber with fuel.
  – High MAP releases this into discharge fuel nozzle.
Pressure Carburetors

• Enrichment / idle control
  – Commonly done by throttle linkage.
  – May operate in conjunction with nozzle diaphragm needle valve.
  – It will react to changes in metered fuel pressure and throttle position.
  – Needle will be stepped and tapered.
Pressure Carburetors

- Main metered fuel will be regulated by idle needle valve and discharge needle valve.
- When throttle opens, idle needle valve is opened and removed from main metering action.
Pressure Carburetors

• Mixture control circuits
  – will be manual
  – may have automatic function
  – bypasses A pressure to B pressure or:
  – flow valve regulating metered fuel
Pressure Carburetors

• Mixture control circuits
  – idle cut-off can be:
    – A-B bypass type has throttle linkage that closes D chamber poppet valve.
    – fuel flow regulating type the mixture control valve will simply shut off metered fuel flow.
Pressure Carburetors

• Automatic mixture control will use aneroid bellows modulating a needle valve.
• Will be a density controller (pressure and temperature).
• May be oil dampened.
• Does not replace manual control, just allows for less operational input.
Pressure Carburetors

• Separate fuel control and throttle body
  – precursor to fuel injection
  – one model includes a float vent assembly
  – throttle body has all I/O devices
  – fuel control has all regulating devices except throttle plate
Pressure Carburetors

– Poppet valve action occurs between C chamber metered pressure, and discharge pressure.
– D chamber is inlet fuel pressure.
– A and B pressures felt between C and D pressures.
– Unit has boost venturi (B) and main venturi (auto mix con) pressures
Pressure Carburetors

– Power enrichment by valve opened when excessive differential exists between C and D during auto-rich mixture control setting.

– Idle metered by throttle operated plunger valve, and C - D poppet valve leaf spring.
Pressure Carburetors

– D chamber is high flow fuel staging area.
– Vapor vent float valve will vent vapor back to fuel supply tank.
Pressure Carburetors

• The main advantage of a pressure carburetor is the reduction of icing potential.
• Secondarily throttle transitions and inverted operations are much better.
• Disadvantage = $$$$$$$$$$
Pressure Carburetors

SECTION END