Motorhistoria

Oil Engines: An Interim Solution

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The Oil Engine

Legislation & New Fuels

- 1879 *Petroleum Act* – limited flash point of lamp oil (>23°C)
  - Safer liquid fuel – prohibitive insurance premiums
- Problems with the new less volatile fuels
  - ignition, carboning valves, lubrication, etc.
- Poor thermal efficiency, safety and constantly improving reliability
- Three classifications
  - External vaporizer/mixing chamber
  - Separate vaporization chamber and air intake
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- Three names
  - William Dent Priestman (UK)
  - Herbert Akroyd Stuart (UK)
  - Emil Capitaine (G)

Priestman

- Ignition of less volatile fuels (oil) in low compression engines – pressurized atomizer and heated vaporizer chamber
- both air and fuel throttling – broader operating range/less miss fires
- both heavier and more volatile fractions in the fuel – deposits and preignition ($r_c \approx 2$)
- 1895: service engineer on fishing boat
  - packing glands wear/spark plug sooting
- American version – two flywheels
- Ended by the introduction by other, less expensive engine designs

Akroyd Stuart

- Vaporizing chamber connected to the working cylinder – “hot-bulb”/“Semi-diesel”
- exhaust scavenging
- speed control
- antechamber with only fuel, i.e. no air

Hornsby-Akroyd

Hornsby

- Respected machinery and steam engine builder
- 26/6 1891 Hornsby-Akroyd contract
- Engine improvements:
  - Redesigned fuel pump – cam actuated
  - Changed governor control
    - bypass instead of override
    - bypass placement high – improved air bleed off
    - new fuel line check valves
  - Nozzle water cooling – less carboning
  - Mechanically (cam) actuated intake valve
  - Air cooled vaporizer (fan)
  - Water cooled vaporizer, increased compression ratio (bhp > 5)
- Vital properties for successful engine operation:
  - vaporizer temperature (combustion phasing, volumetric efficiency)
  - cylinder/vaporizer connection (length and diameter)

Hornsby-Akroyd

Success of the Hornsby-Akroyd engine

- No electric ignition system
- Less sensitive to fuel variation
- Lack the need for a skilled attendant

Oil engine lubrication

- Steam engine practice except for cylinder
- Methylated alcohol additives to mineral lubricants

Capitaine Petrolium Engines

- Reduced stroke and increased the bore (Bore $\approx$ Stroke)
  - Higher speed
  - Lower weight and cost
  - higher power density (half the displacement the same hp)
- Different vaporizer designs
  - Bypass vaporizer
  - small, externally heated vaporizer
- Bitter foe of Diesel

Summary – Oil Engines

Pros

- safety
- access to suitable fuel
- reasonable reliability

Cons

- delayed start (10–20min)
- external heating
- carboning
- poor efficiency (13–16 %)