Adsorbed Natural Gas (ANG)

Bringing the benefits of Natural Gas at a fraction of the operational parameters of Compressed Natural Gas

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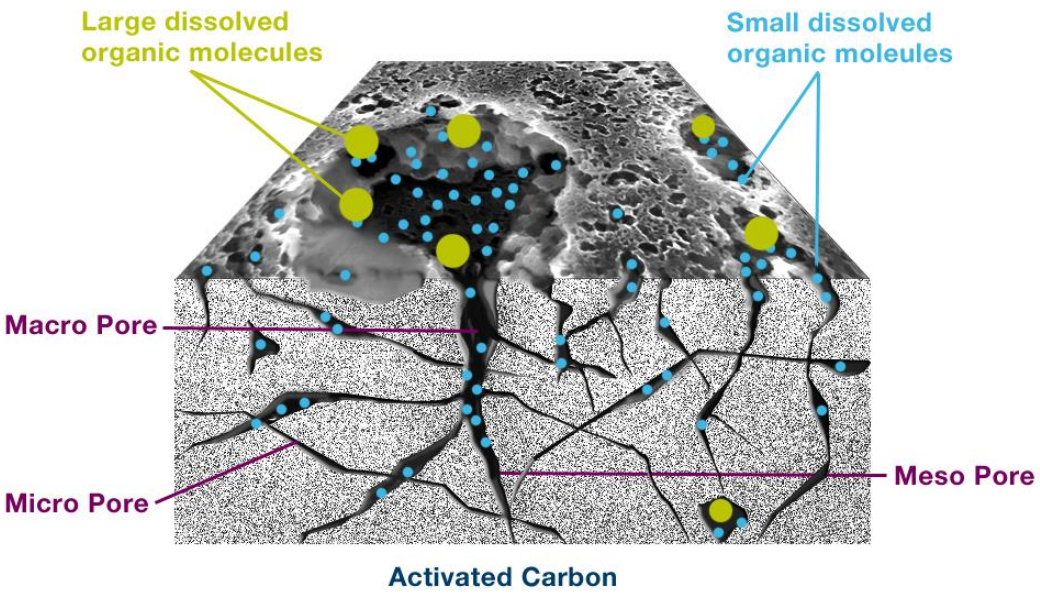
WHAT IS ADSORBED NATURAL GAS?

Activated Carbon for Adsorbed Natural Gas



- Organic molecules are concentrated on the internal surface by physical attraction or chemical reaction
- Physical adsorption is reversible
- Pore size (classified by IUPAC)
  - micropore (< 20 Å)
  - mesopore (20 – 500 Å)
  - macropore (> 500 Å)

Adsorption…

- is the reversible binding of molecules to a surface
- occurs due to weak attractive interactions known as "van der Waals" forces
- is exothermic

Desorption…

- is the reversible removal of molecules from a surface
- is endothermic

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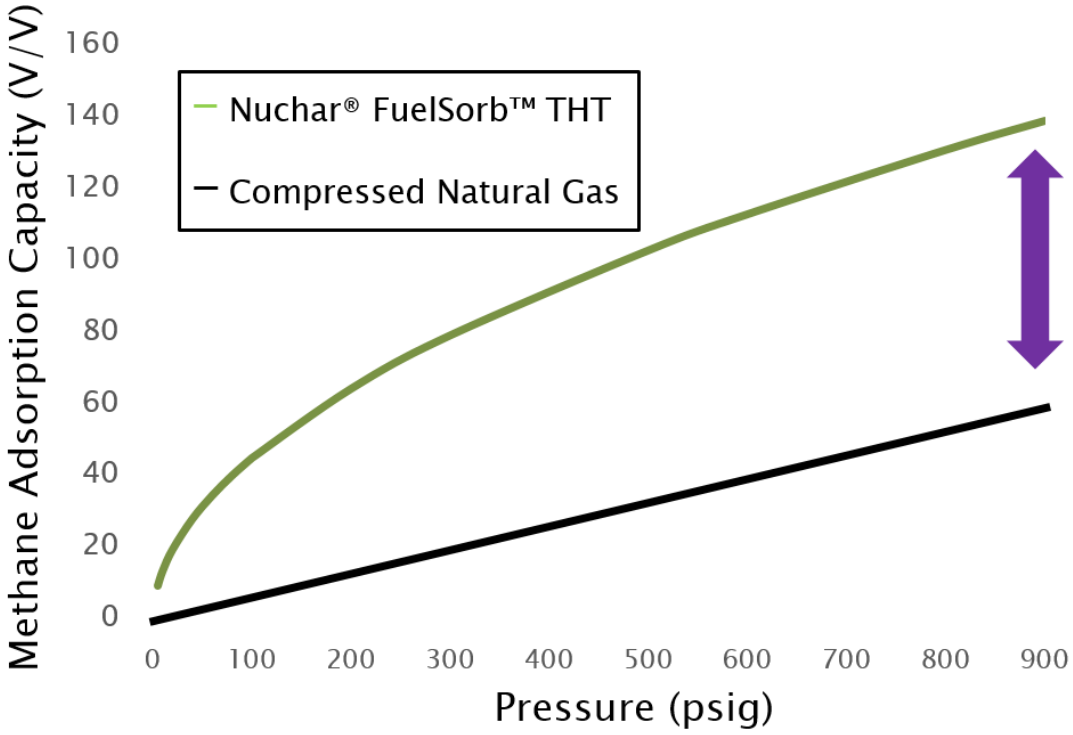
Increased Methane Adsorption Capacity



- 900 psi = optimized commuting mileage range
- Lower the pressure, the greater the MAC of ANG vs CNG
- ANG has 2x NG volume @ 900 psi

Enables access to CNG benefits at a fraction of operational pressure (900 vs 3600 psi):

- Low cost private fueling
- Lower TCO for fueling appliance

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ANG Value Proposition

Environment	20% reduction in greenhouse gas emissions for NGV relative to conventional gasoline*. ▪ >100% when using RNG
Range	A hybrid, bi-fuel vehicle can service 75 percent of daily usage miles with natural gas.
Convenience	Private refueling leverages the infrastructure network already available in nearly 60 million U.S. homes and over 5 million businesses.
Value	Fuel savings for natural gas users range from $1.00 to $1.50 per gasoline-gallon equivalent (GGE) compared to conventional gasoline**.

Value delivered across wide range of key stakeholders

Natural Gas Producer →	Increased natural gas demand
Natural Gas Utility →	Infrastructure utilization
Automotive OEM →	Alternative fuel option where EVs are challenged OR bi-fuel with a single powertrain
Vehicle Owner →	Sustainable fuel savings for individual and fleet operations

*BCG research and article, "The Comeback of the Electric Car?"
**Assumes $2.50/gal average gasoline price and $1.00/GGE natural gas cost (US Energy Information Administration)

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A valuable technology platform

Ingevity's deep automotive experience brings value to fuel storage technology

Ingevity is the leader in **hydrocarbon controlled catch-and-release applications** for automotive emissions control.

Developed and patented **Nuchar® FuelSorb™ activated carbon monoliths** that allow low-pressure (<1,000 psi) onboard natural gas fuel storage paired with conventional gasoline (bi-fuel hybrid).

Low-pressure fuel storage enables safe, reliable and economic refueling of the vehicle.

Delivered to the **fleet and individual consumer**:

- Environmental Benefits
- Extended Range
- Refueling Convenience
- Economic Value

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An ANG bi-fuel Ford F-150 maintains the full vehicle warranty through QVM[1] program

The plug-in hybrid adsorbed natural gas vehicle (PHANGV®)[2]

- Standard package Ford F-150 pickup.
- CNG prep includes hardened valves and seats.
- Flexible cylinder designs allow for a range of on-board natural gas storage (from 2 GGE to 8 GGE).
- Zero-weld cylinder arrays rest conveniently in tool box.
- Designs catered to all body and bed configurations.
- Extended fuel range enabled by complete gasoline and on-board natural gas storage.

[1]Ford's Qualified Vehicle Modifier program for non-standard upfits
[2]PHANGV® is a registered trademark of ANGP

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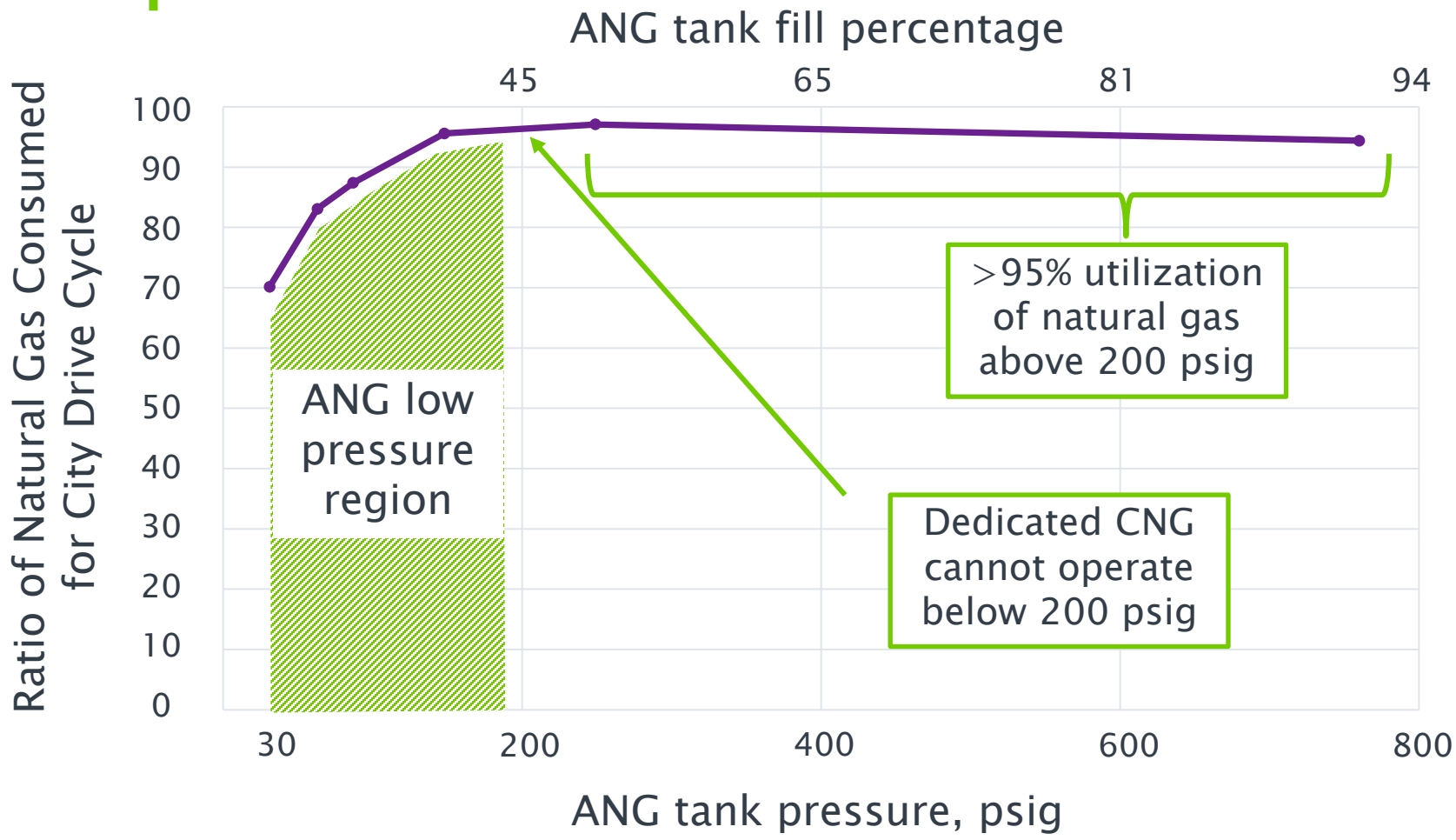
ANG bi-fuel calibration demonstrates expanded natural gas consumption compared to CNG



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