

Propane and Butane.

These two gases are normally found in domestic workshops powering the familiar “bottle torches” that we use for soldering etc. Their use in Locomotive gas burners is however a different matter...

Propane has the chemical formula C_3H_8 and is a member of the ALKANE group of hydrocarbons. It requires 5 Oxygen molecules for complete combustion. The approximate heat from 1Kg of Propane Gas is about 46 Mega Joules and it is easily stored as a liquid at 25 degrees C at a pressure of 1000 Kilo Pascals. The boiling point of Propane is -42 degrees C

Butane has the chemical formula C_4H_{10} and is a member of the ALKANE group of hydrocarbons. It requires 8 Oxygen molecules for complete combustion. The approximate heat from 1Kg of Butane Gas is about 39 Mega Joules and it is easily stored as a liquid at 25 degrees C at a pressure of 300 Kilo Pascals. The boiling point of Butane is -0.5 degrees C.

From the energy output point of view Propane produces a hotter flame than Butane and uses less Oxygen to do it.

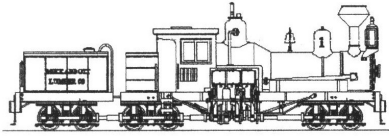
A manufacturer of gas tanks will provide a certificate of pressure testing. This normally states the pressure that the tank was tested at and the type of gas that it is designed to hold.

A typical gas tank certificate is appended on the next page.

There is a tendency for suppliers of gas to mix Propane and Butane in various ratios, a common one being 30% Propane & 70% Butane. This is fine for normal use -but a locomotive burner is **not** normal use. What DOES happen is that when the tank warms the Propane boils off first and pressurises the tank abnormally -sometimes to the point of the pressure release valve blowing. Propane requires 5 Oxygen molecules to burn to completion so setting the burner “correct” at the beginning of the firing means that by the time the Propane has burnt off, the Butane now requires 8 Oxygen molecules -the burner “chokes” for lack of Oxygen. As can be seen the quantity of Oxygen required will vary throughout the length of burn as the mixture changes from the initial pure Propane to the final pure Butane.

It is therefore recommended practice that only pure Butane be used.

Due to the LARGE amounts of heat required to boil the Butane into a gas at normal pressure it has become common to have a “loop” soldered to the boiler back head to ensure that the Butane supplied to the burner is fully gaseous(!)



MACCSTEAM Ltd

M O D E L S T E A M S E R V I C E S

GAS TANK TEST CERTIFICATE

Gas Tank Serial No 130307T

Maker:

Mike Abbott for Maccsteam Ltd

Construction Date:

March 2007

Materials:

All copper construction.
Silver soldered throughout
Bushes – Gunmetal
All materials used conform to appropriate BSI specifications

Note:

This tank has been designed for use with **BUTANE** or **ISO-BUTANE** gas. Butane/Propane mixes may also be used up to a maximum of 40% Propane. **GAS CONTAINING MORE THAN 40% PROPANE SHOULD NOT BE USED IN THIS TANK.**

Always fill the tank in a well ventilated area (preferably outdoors) and away from naked lights.
Before storing the tank after a run, ensure that it is empty.

Test Pressure:

300 psi

Hydraulic Test Date:

13 March 2007

Signed: *M. C. Abbott*

Date: 13-03-07