

A simple spot measurement for gasifier particulates and tars

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Since biomass pyrolysis typically produces 70-90% volatile material, converting these volatiles (sometimes called "tars") to gas is the primary problem of biomass gasification.

Yet, there is no general agreement on what constitutes "tar" or how to reliably measure or estimate it. Millions of dollars have been spent establishing tar measurement protocols which seem to satisfy no one.

A simple "spot" tar and particulate (T&P) test which gives a semiquantitative estimate of T&P level is described here. It uses a Bacharach "True Spot Smoke Test Kit" (cost \$82) which is widely available for testing smoke in boilers. It looks like a hand bicycle pump and draws a measured quantity of sample (about 1 liter per stroke) through a filter paper which traps T&Ps, forming a spot about 6 mm in diameter. One stroke (~ 1 liter of gas) collects enough to be visible (about 50 ppm T&P) from most producer gas samples. Any number of strokes can be used to increase sensitivity and produce a suitably gray spot which is then viewed through a standard gray-scale matching card, yielding an opacity number from 0 to 10.

The meter is used for instance in Germany to test all fireplaces and those not passing must be fixed. If ten strokes produces a spot of > 5 opacity, you are legally required to get your chimney or fireplace fixed!

The True Spot tester can also be used to measure T&P from gasifiers once it has been calibrated against another gravimetric method. We report calibration and tar data on various power and cooking gasifiers.

In addition, paper chromatography can be applied to the spots to separate the major components of the tars in order to give a fingerprint of the gasifier in terms of primary/secondary or tertiary tars.