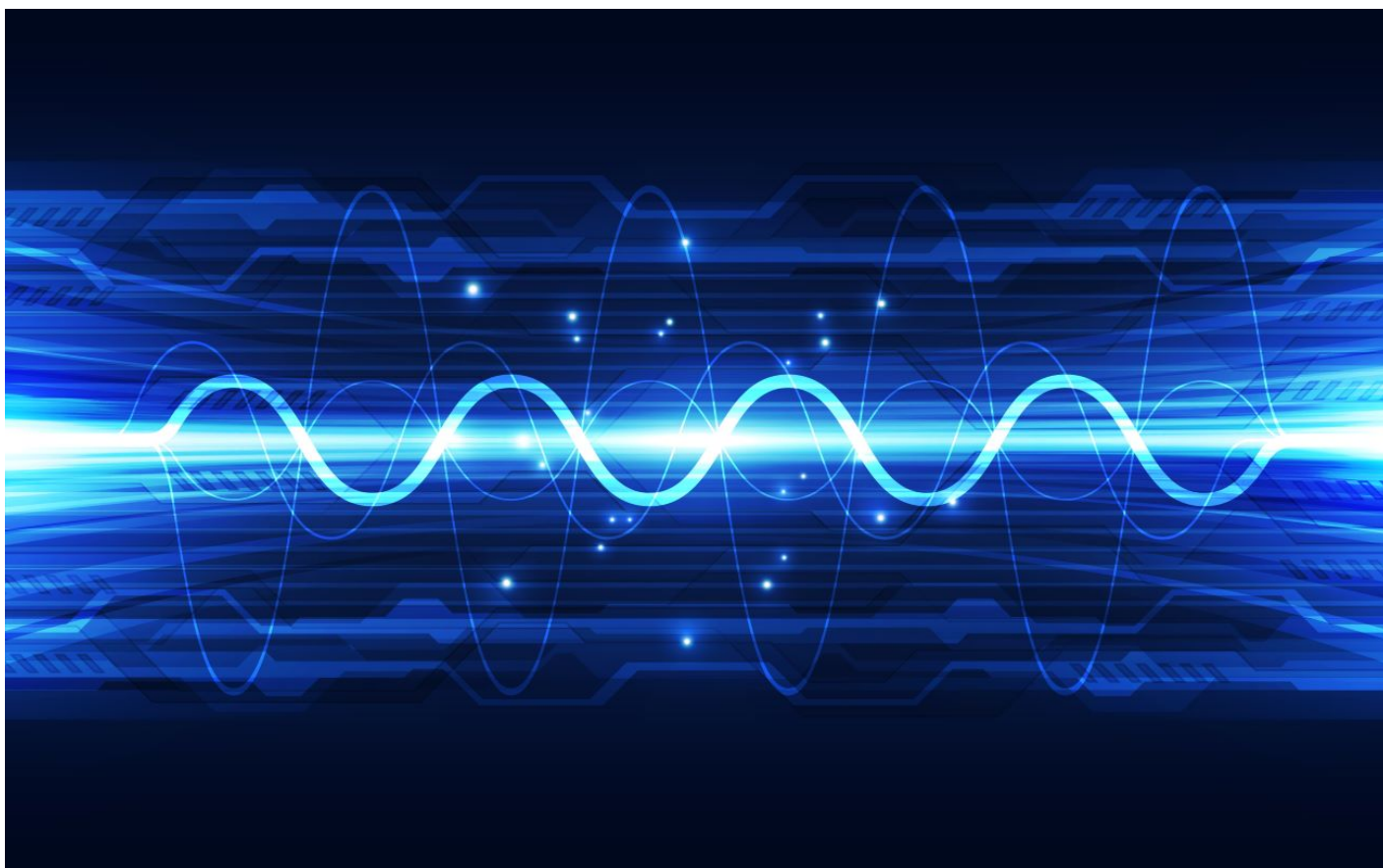


# METHANE FROM FLARING TOOLKIT



## Composition: Infer Molecular Weight (MW) from Speed of Sound (SoS)

Do I know the gas composition? > Composition: Infer Molecular Weight (MW) from Speed of Sound (SoS)

### Summary

To allow the combustion and destruction efficiencies of a flare system to be estimated, the molecular weight of the flare gas can be helpful. This is normally derived from the composition of the flare gas.

If taking a sample for laboratory analysis or on-line compositional analysis is not possible, then, if a gas ultrasonic meter is installed on the flare system and the speed of sound is available as an output, then the molecular weight of the gas can be derived as a direct relationship to the SoS.

### How it Works

To derive MW from the SoS, we need to understand the relationship of SoS in an ideal gas, this is as follows:

$$v = \sqrt{\frac{\gamma RT}{MW}}$$

Where:

$v$  = speed of sound

$\gamma$  = adiabatic constant

$R$  = gas constant

$MW$  = molecular weight of gas ( $MW$ )

$T$  = absolute temperature

So, to derive the  $MW$  of the flare gas, the above calculation can be manipulated as follows:

$$MW = \frac{\gamma RT}{v^2}$$

This calculation can then be entered into either the flare meter controller/ flow computer or within the DCS / ICSS and the corresponding  $MW$  can be utilised to enable the calculation of the combustion and destruction efficiency.

Utilisation of the inference of  $MW$  from SoS is not a common application but can be used when no sampling or analysis facilities are available on the flare systems.

#### Advantages

- ✓ No Equipment costs
- ✓ Minimal Maintenance costs
- ✓ On-line continuous calculation

#### Limitations

- ✗ An assumption on the adiabatic constant must be made, based on the likely composition of the flare gas
- ✗ Low Accuracy
- ✗ High Uncertainty

#### Go Deeper

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#### Case study

No case study available at this time.

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## Do I know the gas composition?



Composition: Spectrometry (GC – MS)



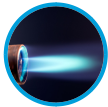
Composition: On-Line



Composition: Laboratory Analysis



Composition: Specific Gravity Analyser (Relative Density)



Composition: Wobbe Index Analyser (Calorimeter)