

# Application of chromatography and mass spectrometry to unravel complexity of diesel fuel

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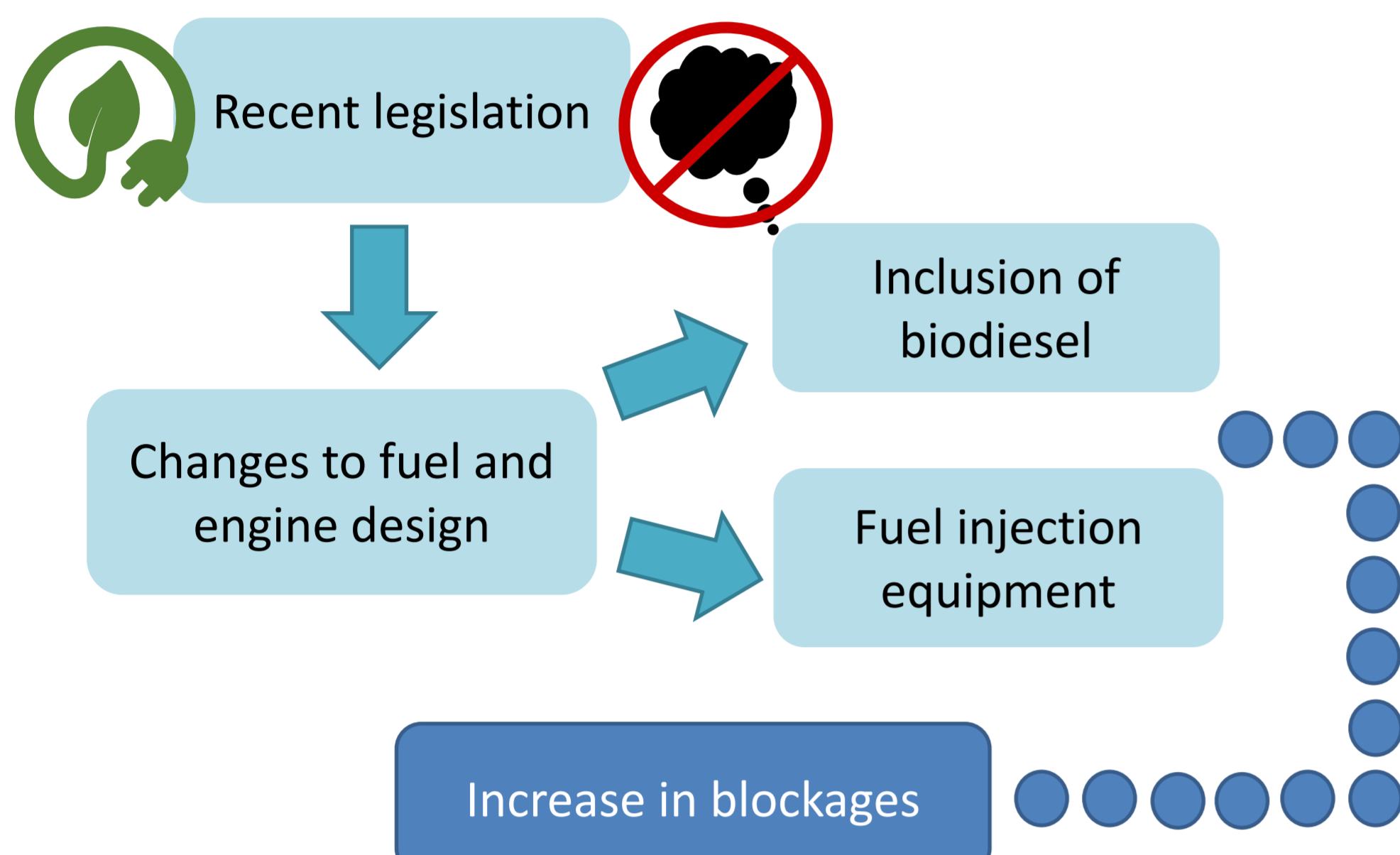
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## Introduction

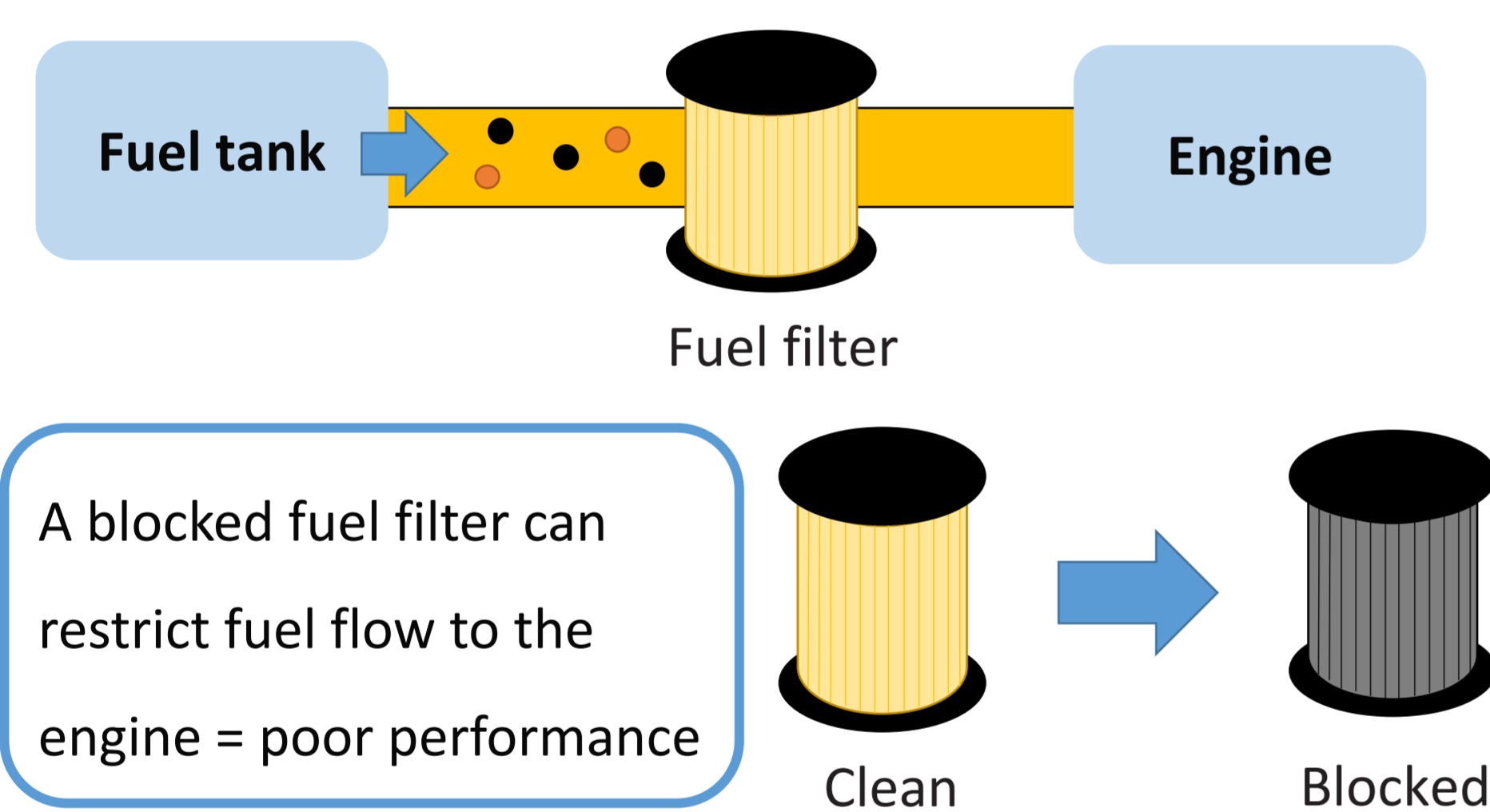
- Blockages to engine fuel lines are becoming more of a problem<sup>1,2</sup>
- Blockages can result in failure of fuel delivery to the engine
- New chromatography and MS methods have been developed to separate and identify suspect components that cause blockages

## Why is there an issue now?

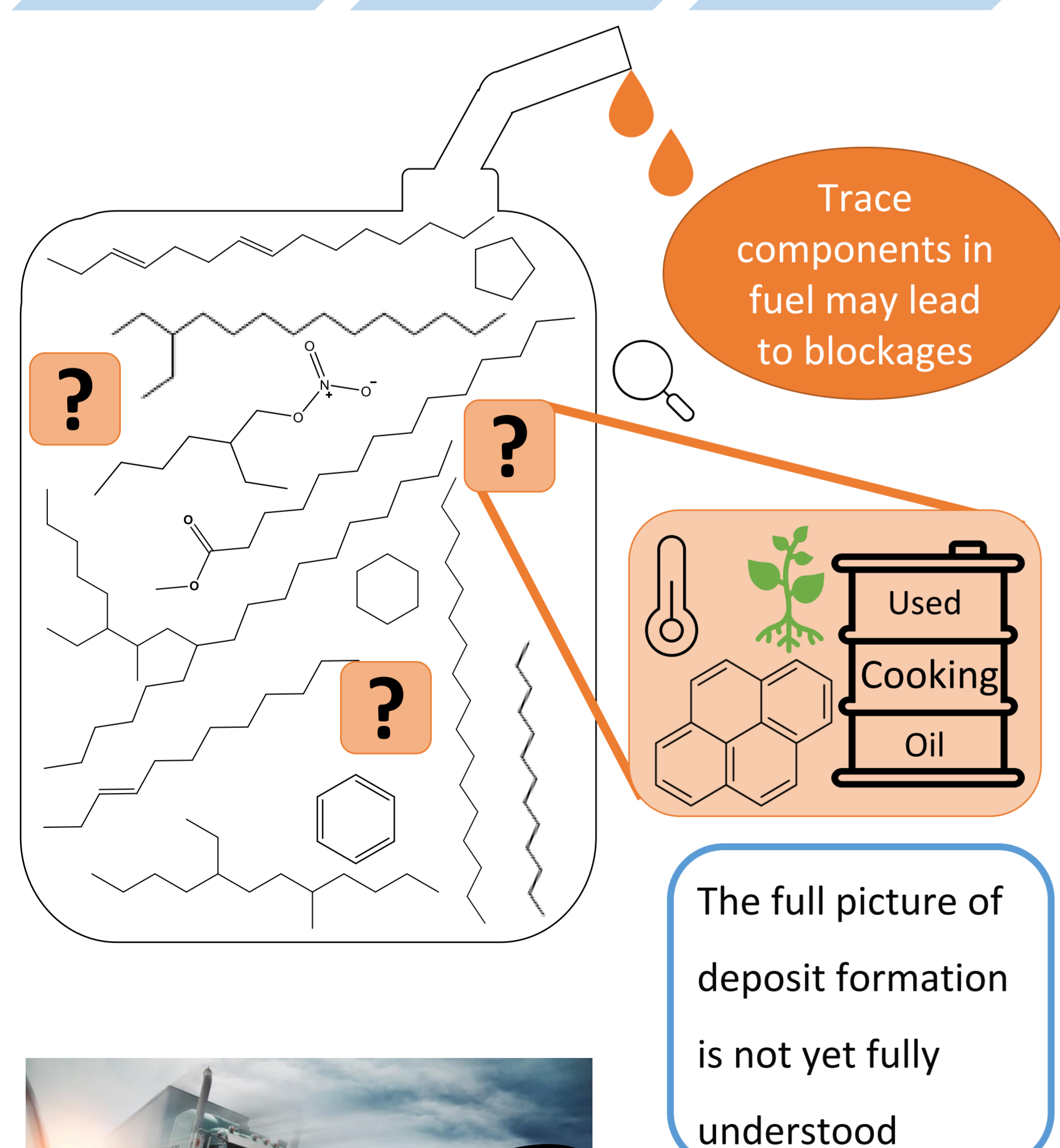
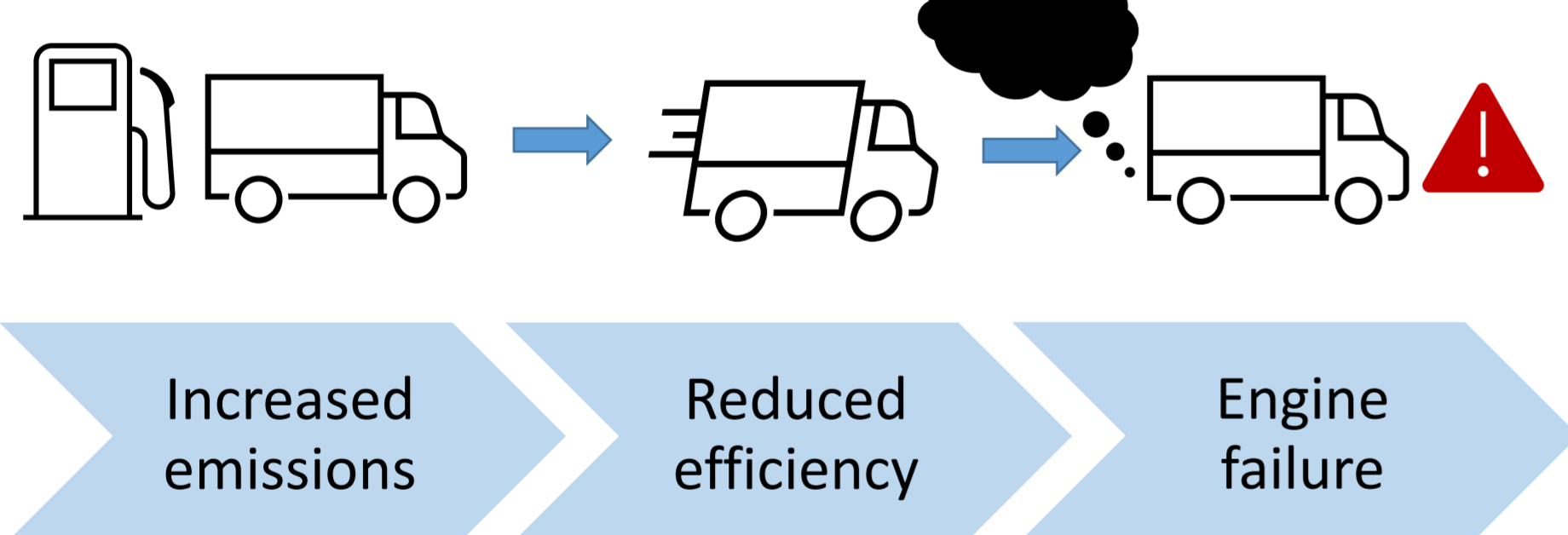


## What is the problem?

- Blockages are caused by a build up of insoluble material in the fuel delivery system
- A fuel filter removes particulate matter from the fuel



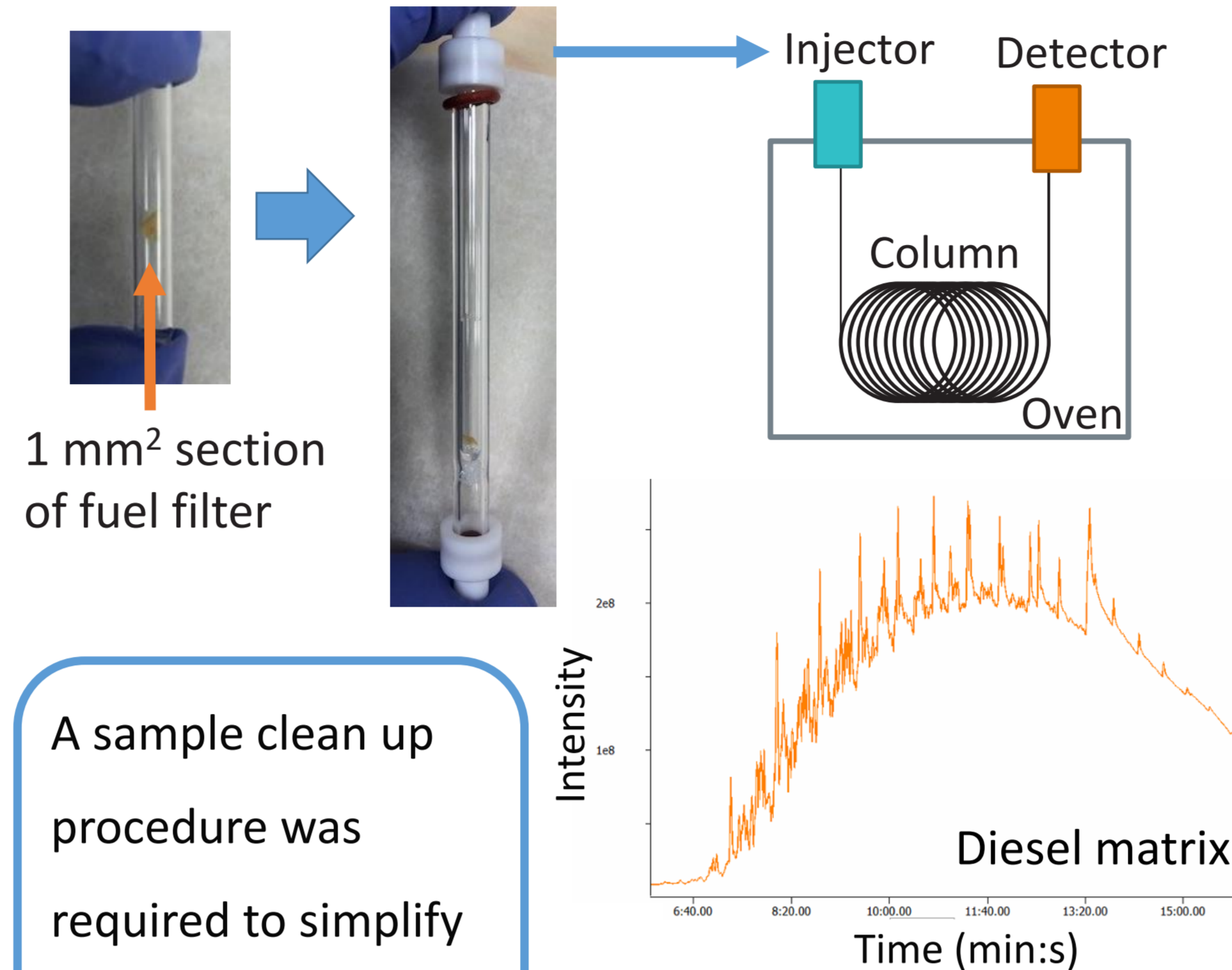
## Poor performance



UHPSCF-MS  
GC-MS  
FT-ICR MS  
GCxGC-MS

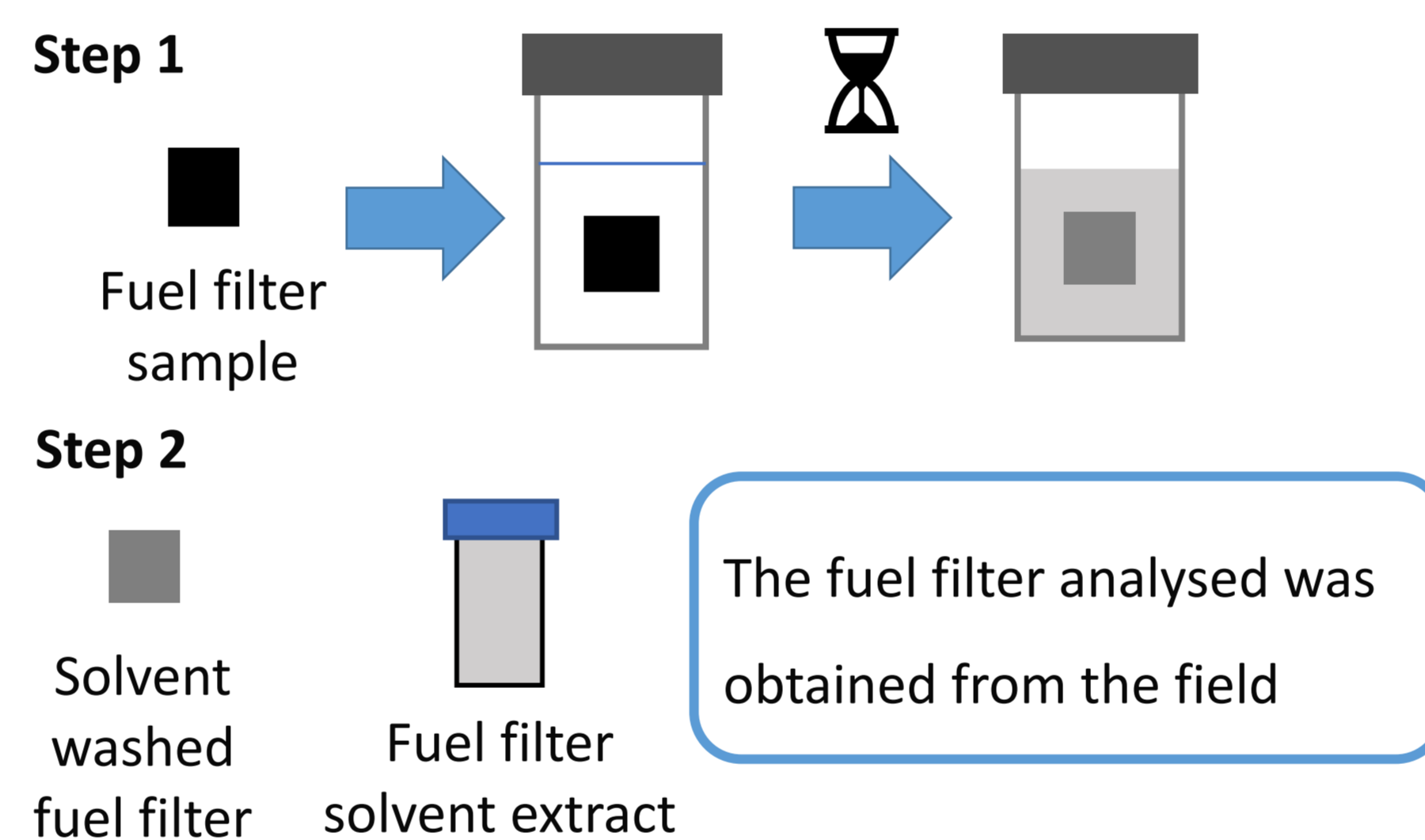
## Analysis of fuel filter blockages

- Thermal desorption (TD) style sample introduction allows GC-MS analysis of fuel filter material
- Liner is placed into GC injector unit and heated rapidly, analytes desorb from the filter

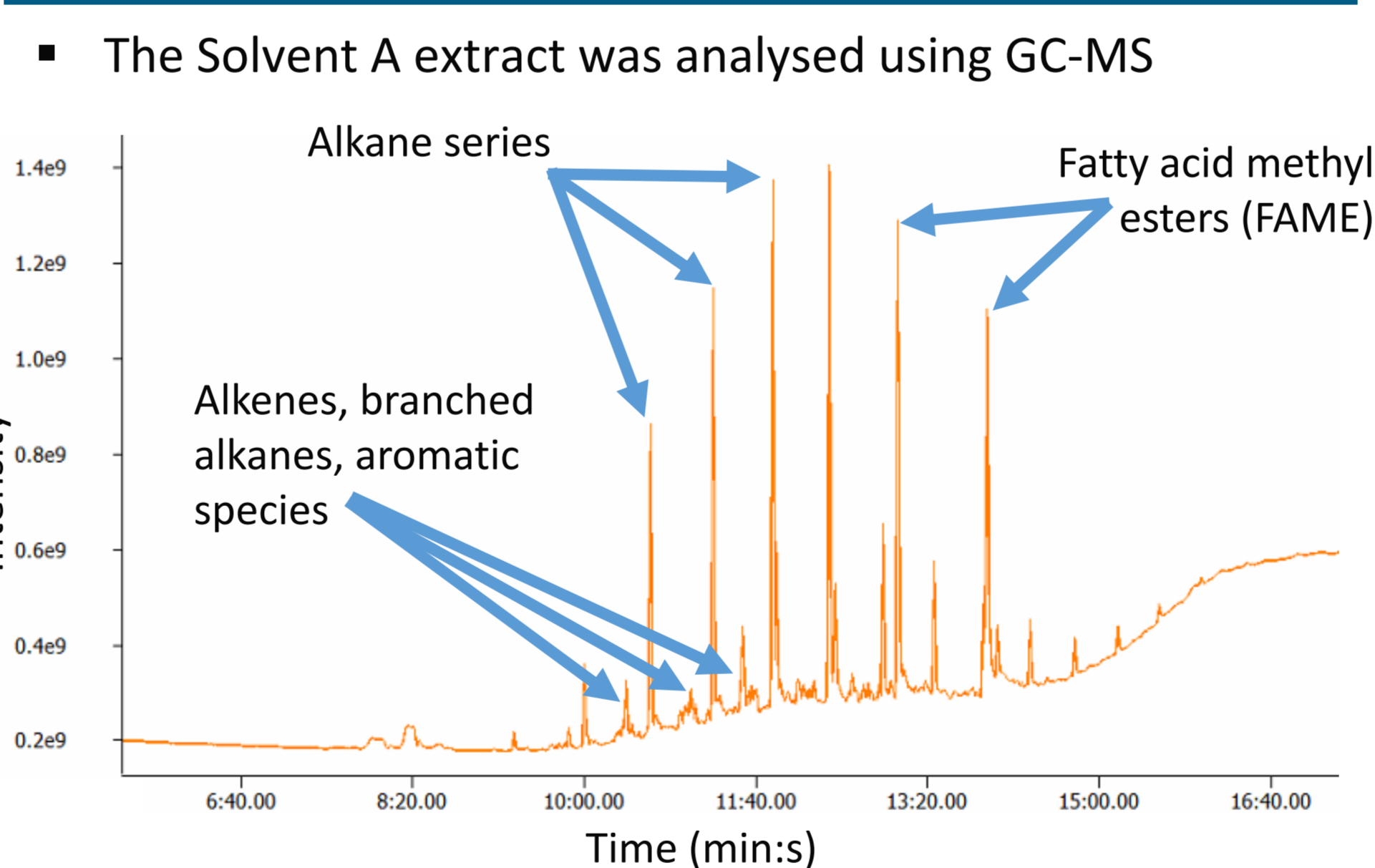


A sample clean up procedure was required to simplify the sample matrix

- Step 1: A section of fuel filter soaked in solvent for 15 minutes. Repeated with different solvents
- Step 2: The corresponding washed filters and solvent extracts are obtained for analysis

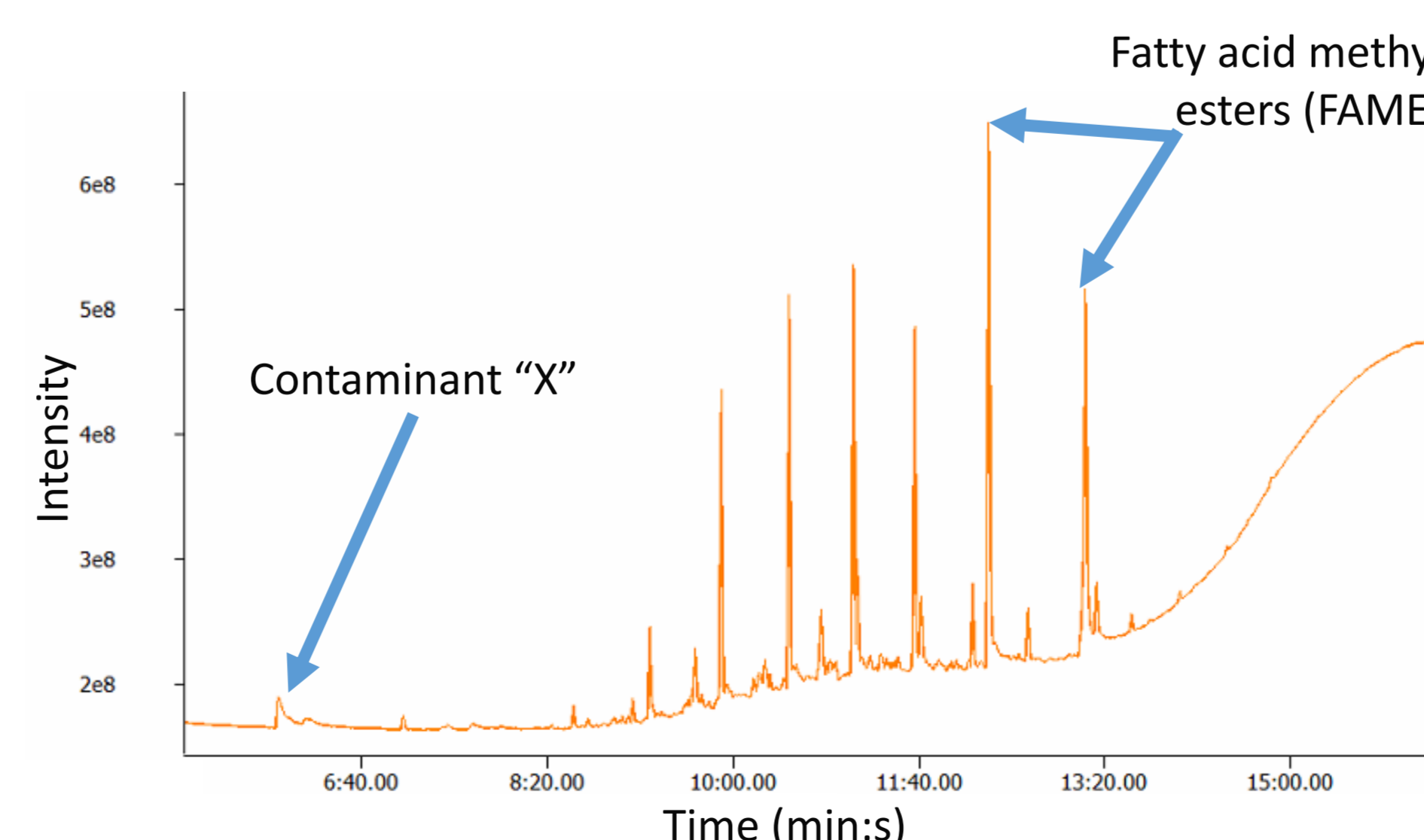


## GC-MS Analysis: Solvent extract



Solvent A extract demonstrates the presence of diesel matrix in the filter sample, as expected

- The Solvent B extract was analysed using GC-MS

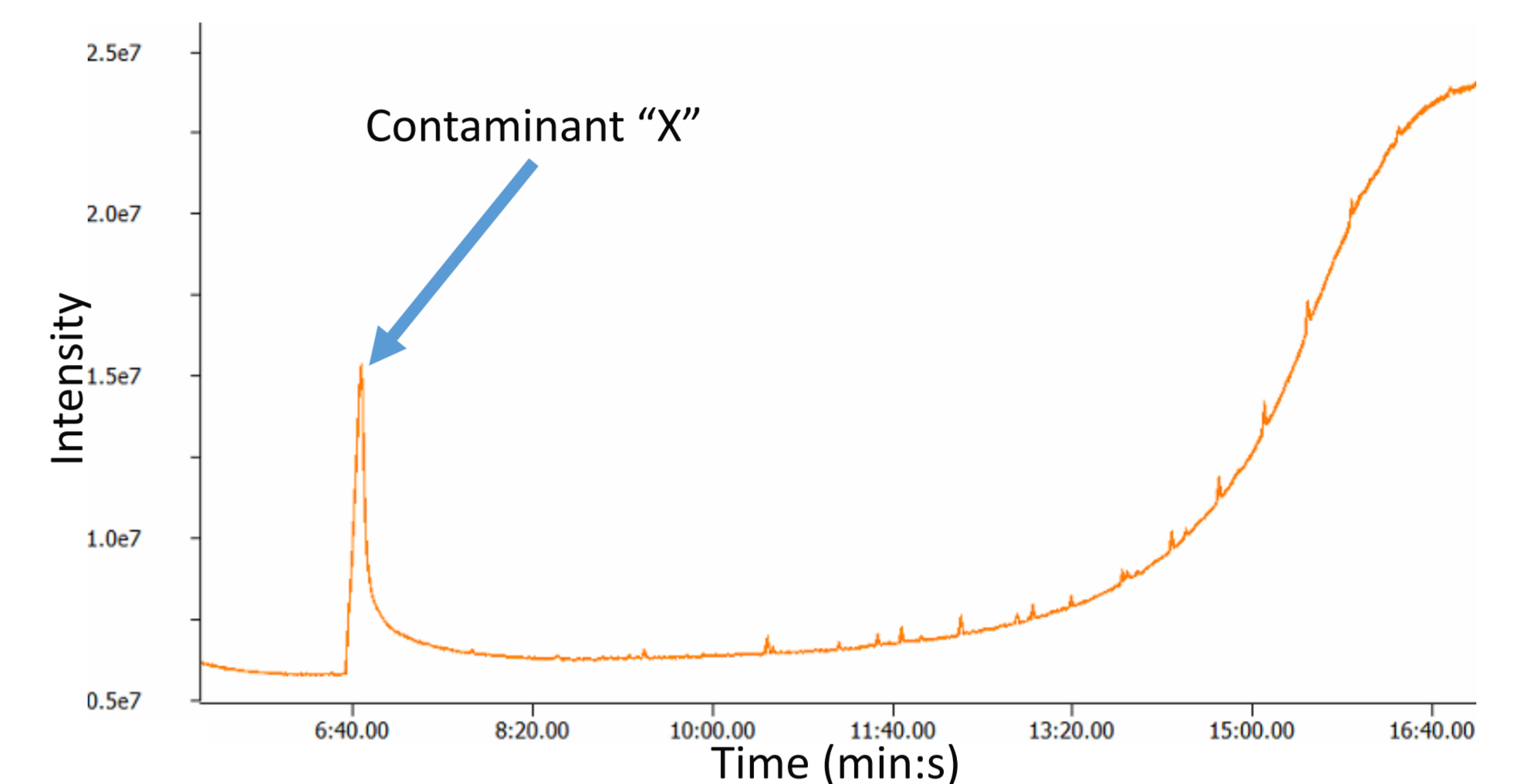


- A portion of diesel matrix is present in solvent B extract
- Contaminant "X" present in solvent B extract but not present in solvent A extract

## GC-MS Analysis: Washed filter

- Using TD-style sample introduction technique, solvent A washed filter paper was analysed using GC-MS

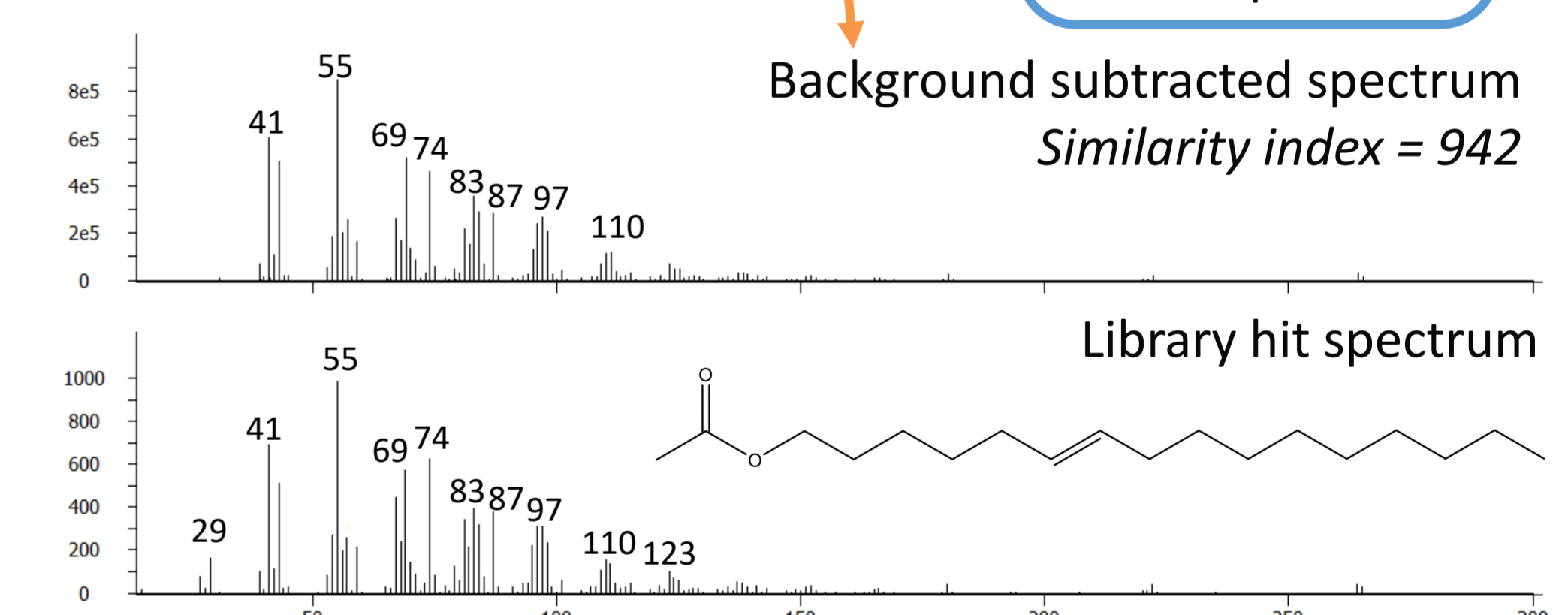
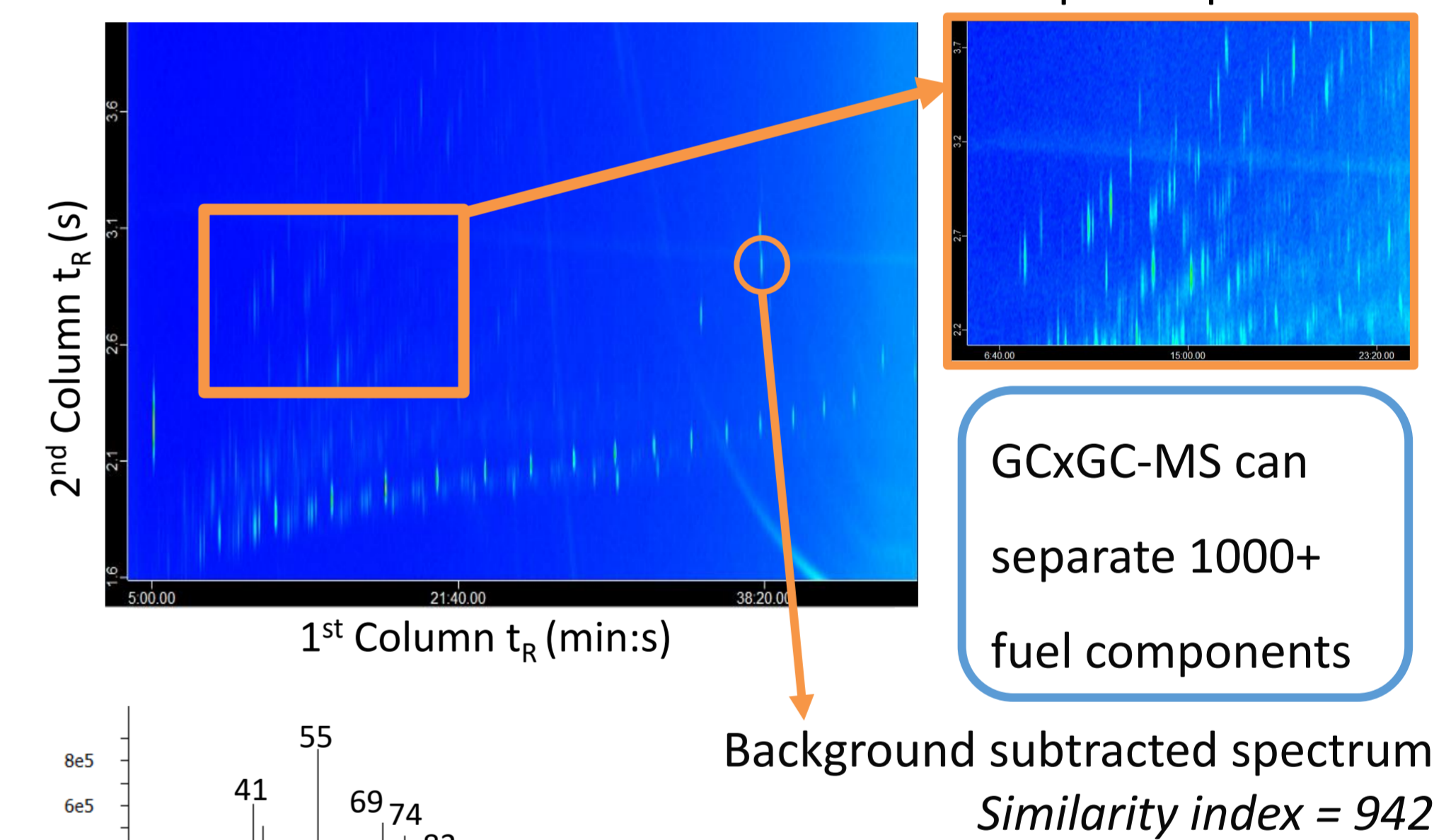
- Majority of diesel matrix washed away in the sample clean up procedure
- Contaminant "X" remains on filter paper



- This corroborates GC-MS analysis of solvent B extract
- Complimentary data from UHPSCF-MS gives confidence in assignment

## Complexity of diesel fuel

- GCxGC-MS aids in unravelling the complexity of diesel fuel
- Overcoming co-elution issues occurring when using GC-MS, GCxGC-MS allows identification of further species present



## Conclusions

- Hyphenated approaches needed to detect trace problematic components
- Different sample preparation and introduction techniques exploit the different chemistries of problematic contaminants. Contaminant "X" identified by exploring these alternative techniques
- Using information about the cause of blockages, mitigation strategies can be established

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## References

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