

# Fats, oils and greases (FOG): From problem to resource

# Stream

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## Introduction

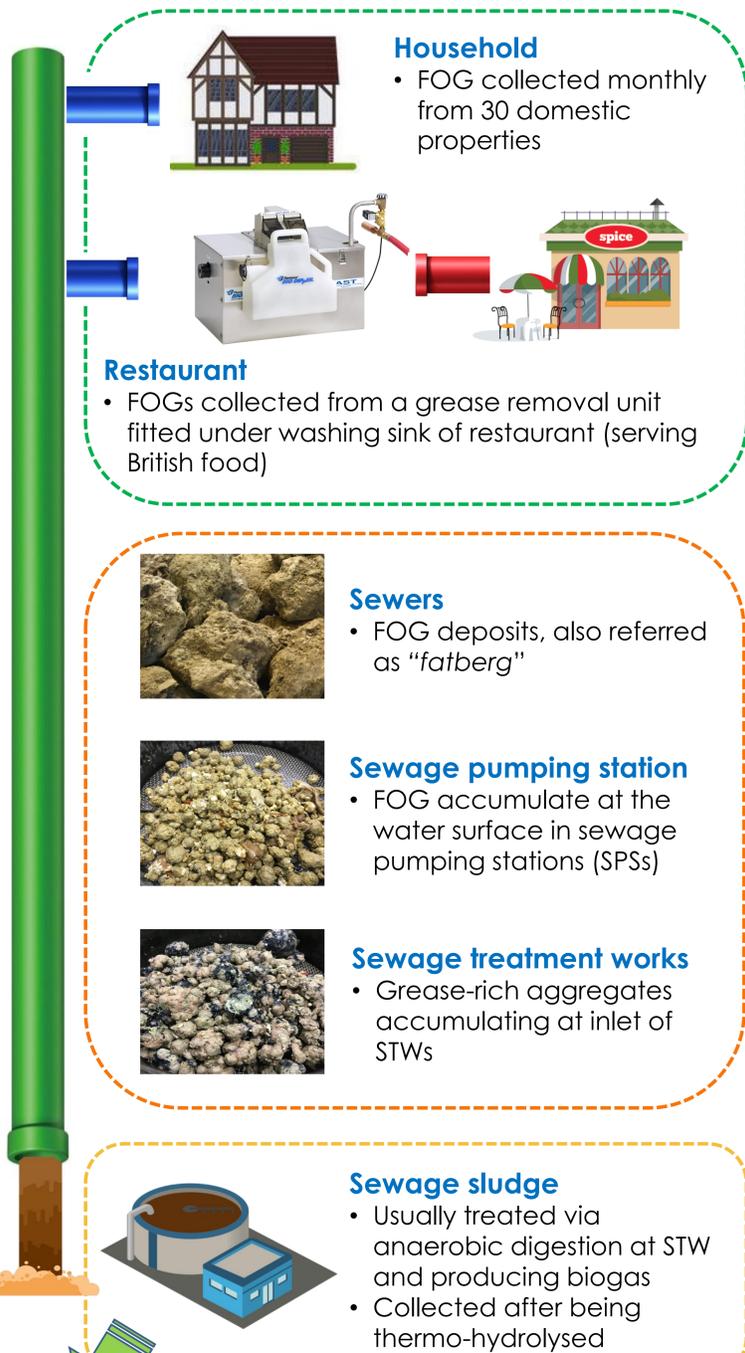
### Fats, oils and greases (FOG)

- describe a variety of lipid-rich material originating from food preparation and cooking processes
  - cause operational problems in all parts of wastewater systems, from sewers to sewage treatment works (STWs) contributing to blockages, increased maintenance and costs
  - collectable at several points in a wastewater catchment to be further used for energy recovery
- The aim of this work is to clarify the variation among collectable FOG in regards to their **physicochemical properties** and their **bio-methane potential**

Want to know more about FOG?



## 1 Collection



## 2 Characterisation

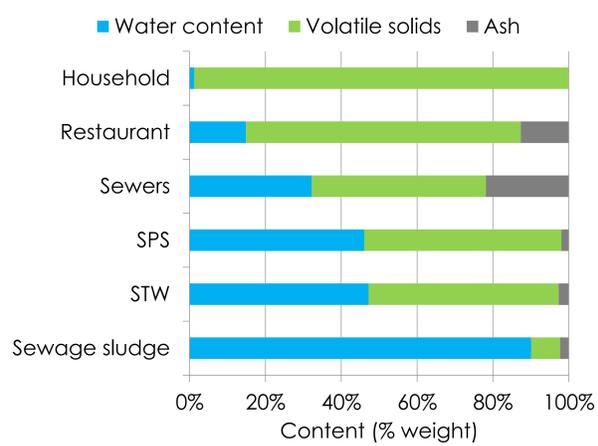


Figure 1. Water, organics and ash content

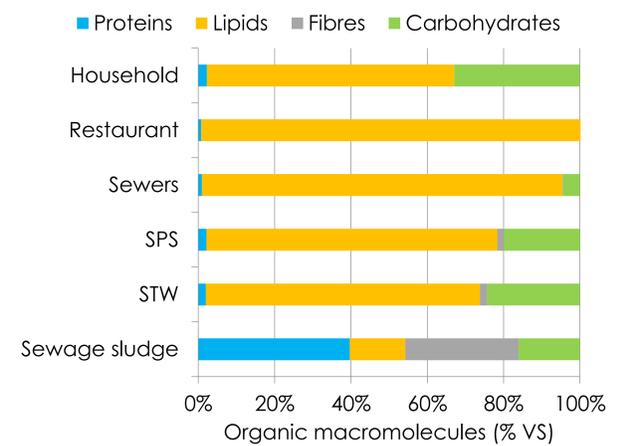


Figure 2. Organic macromolecules content

- Results showed that FOG have **high value for energy recovery** (Fig. 2)
- However, FOG found in sewers, SPS and STW are not free of **contaminants** (e.g. plastics, stones and grits) which could cause damage to the anaerobic digestion process or conversion into biodiesel challenging

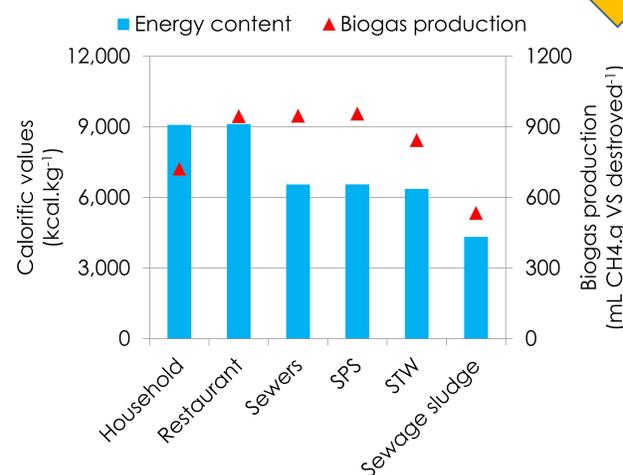


Figure 3. Energy content and biogas production

### What the FOG?

**Lipids** 1.01 L.g VS<sup>-1</sup> > 9.00 kcal.g<sup>-1</sup>

**Proteins** 0.50 L.g VS<sup>-1</sup> > 4.00 kcal.g<sup>-1</sup>

**Carbohydrates** 0.41 L.g VS<sup>-1</sup> > 4.00 kcal.g<sup>-1</sup>

### How much energy is that?

**2,679.07 kcal.kg<sup>-1</sup>** (equivalent to 14 hamburgers)

**419.85 kcal.kg<sup>-1</sup>** (equivalent to 88 cans of coke)

Great, but how much is 1 kg?

### Anaerobic co-digestion?

- Simultaneous digestion of two or more substrates (e.g. FOG and sewage sludge)
- Increase the biogas generation and improve plant's economics

- The energy contained in 1 kg of FOG (collected at source) can be equivalent to up to **14** hamburgers or **88** cans of coke (Fig. 3)
- Volatile solids (VS) reduction ranged from **64.44** to **93.81%** for FOG compared to 68.71 for sewage sludge: most of the organics are converted into bio-methane
- FOG can generate up to **2.4** times more biogas per grams VS destroyed than sewage sludge

## Conclusion

- FOG are desirable substrates for anaerobic co-digestion; FOG collected at source could be more valuable than other FOG wastes for biodiesel conversion (i.e. less contaminants)
- Harvesting these resources in kitchens **before they reach the sewers** would have significant benefits both in terms of avoiding sewer incidents (e.g. blockage and flooding) and energy recovery
- Further work is needed to evaluate the economics associated with developing collection schemes at source

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