	Half-life (sec)
Sample 13	510
Sample 14	650
Sample 15	1720

Table 9: half-life

The figures set out in Table 9 indicate that the stability of the foam generated by a brine solution increases when the quantity of biopolymer in the additive is increased.

Example 6

The foaming additives have the following compositions:

	Parts by weight (%)	
	Sample 16	**Sample 17**
Sodium lauryl ether sulphate (ethoxylation number 2)	10.0	1.0
Sodium alkyl ether sulphate (ethoxylation number 7)	-	10.0
Xanthan gum	-	0.3
Water	90	88.7

Table 10: composition of samples

The stability of the foam generated by an aqueous solution prepared by adding 2% by weight of foaming additive to 5000 g of brine is evaluated. The stability is expressed as the half-life, which indicates the time required for the weight of the foam to halve. The test is conducted by evaluating the time in which water amounting to half the weight/volume of the foam is released in a 250 ml cylinder.

The foam is formed by a generator that conveys the flow of liquid at a constant airflow into a glass ball mixer.

	Half-life (sec)
Sample 16	450
Sample 17	560

Table 11: Half-life

CLAIMS

1. A liquid foaming additive for use in mechanised excavation by a tunnel boring machine, containing 5-40% by weight of one or more surfactants, 0.01-5% by weight of one or more biopolymers and 55-94.99% of water.

2. A foaming additive according to claim 1 wherein the surfactant is anionic, cationic, non-ionic or amphoteric.

3. A foaming additive according to claim 2 wherein the surfactant is anionic.

4. A foaming additive according to claim 3 wherein the anionic surfactant is an alkyl ethoxy sulphate or laureth sulphate salt.

5. An additive as claimed in claim 4, wherein the anionic surfactant is an alkyl ethoxy sulphate salt having a C_{10}–C_{14} alkyl chain and an ethoxylation number ranging from 1 to 9.

6. A foaming additive according to claim 5 wherein the salt is the sodium salt.

7. A foaming additive according to one or more of claims 1 to 6 wherein the biopolymers are polysaccharides.

8. A foaming additive according to claim 7 wherein the biopolymer is xanthan gum or guar gum.

9. Use of the additive of claims 1-8 to generate foam capable of conditioning excavated soil.

10. Use according to claim 9 wherein the additive is added, in percentages ranging from 0.1 to 4.0% by weight, to water pumped into a foam generator.