KEEEN

KEEEN INNOVATION SOLUTIONS PRODUCTS CONTACT US

KEEEN Oil Spill Response Solutions

From problem to solution

KEEEN

Oil spill on the sea…

… reaching a shore and …

… to be cleaned.

… damaging wildlife …

Oil spill on the sea

- Rapid and total removal of the oil by mechanical means is not feasible at a spill of any significant size
- Addition of chemicals into the environment is undesirable. Dispersants are toxic, or their use causes the oil to have greater toxic effects.
- Traditional dispersants tend to move the oil out of sight accelerating its sinking below surface.
- Natural **KEEEN Oil Spill Control (OSC)** bioremediation agent produce a net environmental benefit by rapidly initiating oil degradation from the sea surface and preventing or minimizing surface and shoreline impacts.

Solutions offered

- First remove the thick oil slick by mechanical skimmer systems made by the Finnish government owned company Sea How (http://www.seahow.fi/en/cleansea.html)
  - For their products see the videos on these pages:
    - ✓ http://www.seahow.fi/en/cleansea/solutions/inbuiltrecover.html
    - ✓ http://www.seahow.fi/en/cleansea/solutions/maxibagger.html
    - ✓ http://www.seahow.fi/en/cleansea/solutions/minibagger-2.html
    - ✓ http://www.seahow.fi/en/cleansea/solutions/lightscooper.html
    - ✓ http://www.seahow.fi/en/cleansea/solutions/smartsacker-system.html
- Then apply KEEEN Oil Spill Control for final bioremediation of a thinner oil film on a wider sea area

Why KEEEN products?

KEEEN

BACKGROUND:

- Environmental pollution from fuels, fats, oil, grease and other compounds is a major problem today. Collection and cleaning from water/ground is challenging.
- Chemical dispersants and cleaning agents are used widely by oil spill response companies and industrial users.
- These agents are typically solvent based and hence hazardous to environment and nature.

MARKET NEED:

- Companies working in damage control of spills of fuel, oil, grease, etc., need environmentally sustainable means to improve efficiency in remediating the pollutants.
- We have to improve the work safety of consumers and workers against hazards caused by the use of cleaning substances containing solvents and other hazardous agents.
- The world needs sustainable solutions with 100 % natural substances to safely and effectively remove and dissolve fuels, oil and grease.

SOLUTION:

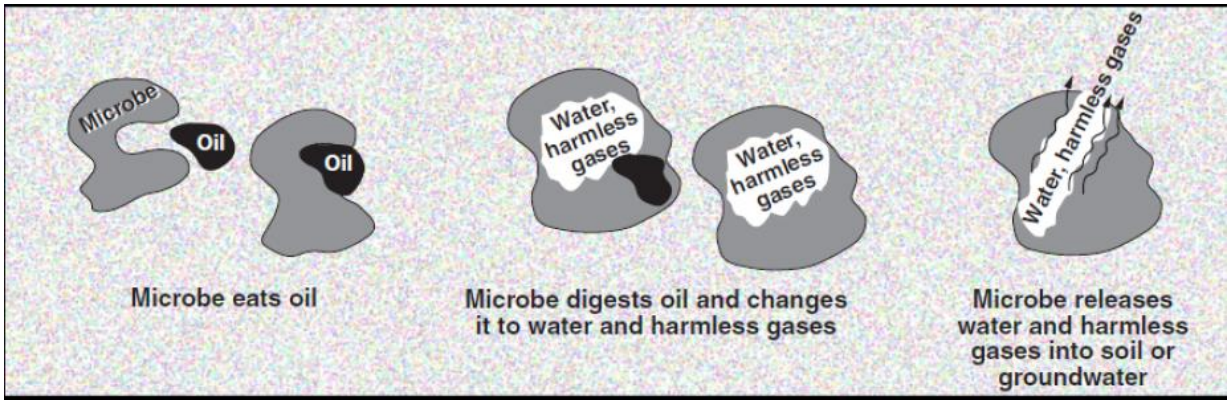
- KEEEN Ltd makes available a family of **KEEEN** bioremediation agents which degrade hazardous compounds from fuels, fats, oil, grease and other dangerous substances.
- These products leave no hazardous remnants and do not damage the purified object.

KEEEN Technology

Oil-degrading microbes

Bioremediation Formulation

Bio Fermenter



Why KEEEN Oil Spill Control?

KEEEN

- Based on two decades of academic research to make it work anywhere
- It is all natural and organic, containing
  - micro nutrients, biological accelerators, microbes and water.
- Neutral pH, non-corrosive, non-toxic, non-flammable
- Start cleanup of emergency spill quickly, effectively
- Preferred by authorities and national oil company in Thailand
- Mitigates fire hazards

Use of OSC on an oil spill on the sea

1. Estimate the spill area, thickness of oil slick and determine oil type
2. Estimate the oil volume (thickness X area)
3. Reserve OSC amount equaling 10% of the oil volume
4. Mix it with sea water to 1:40 ratio
5. Apply with a high pressure sprayer on the whole spill area to initiate bioremediation quickly

Big Oil Spill on Samed beach

Rayong, Thailand

KEEEN

The whole beach was fully cleaned within a week by KEEEN

Samed beach cleaning with OSC

From oily beach to clean sand through repeated OSC treatment

Applying OSC on shore

Spraying KEEEN Oil Spill Control on dry land waiting for rain to complete bioremediation

Oil stained mangroves before spraying with Oil Spill Control

Oil stained mangroves after spraying with Oil Spill Control

A case on water and soil

KEEEN

Valence Co., Ltd. faced the problem of oil and chemical contaminant on land and in a pond of water in a private area about 200 m apart from each other. The contaminants caused complaints from people in the surrounding area.

The problem was due to negligence of the personnel of a subcontractor whose workers had drained oily wastewater on land, which flowed into a pond being on lower elevation compared to the spill area.

Over time, the oil accumulation polluted and degenerated the soil and water. The soil became more black and stinking and the water surface appears to be contaminated with oil and stinks with dead fish.

Case study

Testing Procedure was divided in 2 parts

1. KEEEN Oil Spill Control remediate oil contaminants in water.
2. KEEEN Oil Spill Control remediate oil contaminants in soil.

Test case on water

KEEEN

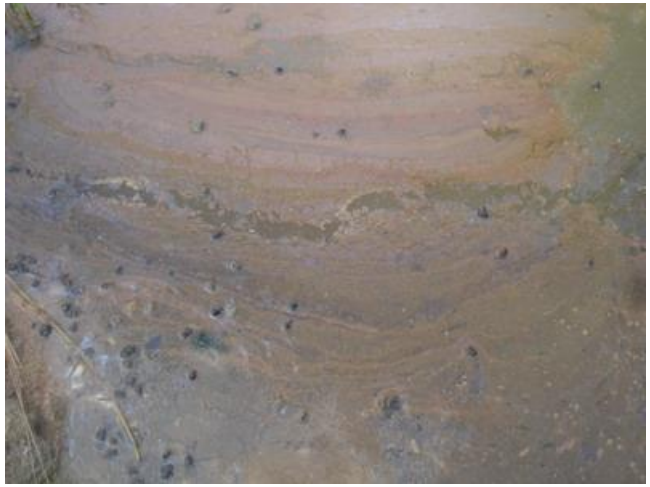
Procedure

1. Prepare electric supply, water pump, rubber tube and joints.
2. Arrange a bucket and high pressure pump for mixing KEEEN Oil Spill Control.
3. Connect water pump and circulating water system with high pressure pump for pumping oil contaminating water into a bucket.
4. Mix KEEEN - Oil Spill Control formula with water in a ratio of 1:40 into a container of a high pressure pump.
5. Spray KEEEN - Oil Spill Control into the pond.
6. Spray all area in the pond and repeat spraying for 5 hours.
7. Use air shaker for circulating water and adding air into the pond for a week in order to enhance biodegradation all the time.
8. Test again

KEEEN Oil Spill Control and Water Needed

- Measure the amount of oil in the contaminated water using the following formula: thickness of oil X (times) contaminated surface area = 0.002m X 22/7 (Phi) X 7.5m X 7.5m (Radius) = $0.354m^3 \approx 0.4m^3$ of spilled oil.
- The amount of KEEEN OSC needed is 10% of spilled oil volume = 10% of $0.4m^3 = 0.04m^3$ or 40 liters.
- Diluting to a ratio of 1:40 means a need of 1600 liters of water

Pond cleaning procedure



1. Feature of water in pond before remediating

2. Bring the water sample from pond to analysis by Hydrocarbon measure

3. Pump water from pond and put it in the bucket

4. Mixing KEEEN OSC in High Pressure Pump

Pond cleaning procedure

KEEEN

5. Spray OSC (contained in the high pressure pump) to the pond

6. The microbes in OSC reacted by digesting the oil in the contaminated water

7. Using air shaker to produce O2 in water for a week

8. After using OSC, it is shown that the water became cleaner.

Results of analysis

VALENCE CORPORATION LIMITED

From:

Waste pond near Valence Co.,Ltd.

Valence representative:

Varoon V.-Thailand

Analysis Number: LBW/112/06

Date Received: December 6-13, 06

Date Completed: December 13, 06

Date Printed: December 13, 06

KEEEN

COD = Chemical Oxygen Demand

Water Analysis

Item	Receive sample date	Natural Water Sample			Waste Water Sample		
		pH	Appearance	COD(mg/l)	pH	Appearance	COD(mg/l)
1	6/12/2006	Neutral		-	Neutral	Slightly yellowish color	9088
2	7/12/2006	Neutral	Slightly yellowish color	11	Neutral	Slightly yellowish color	33
3	6/12/2006	Neutral	Slightly yellowish color	6	Neutral	Slightly yellowish color	103
4	12/12/2006	Neutral	Slightly yellowish color	32	Neutral	Slightly yellowish color	48
5	13/12/2006	Neutral	Slightly yellowish color	34	Neutral	Slightly yellowish color	45

Mode: The results refer to the submitted sample only.

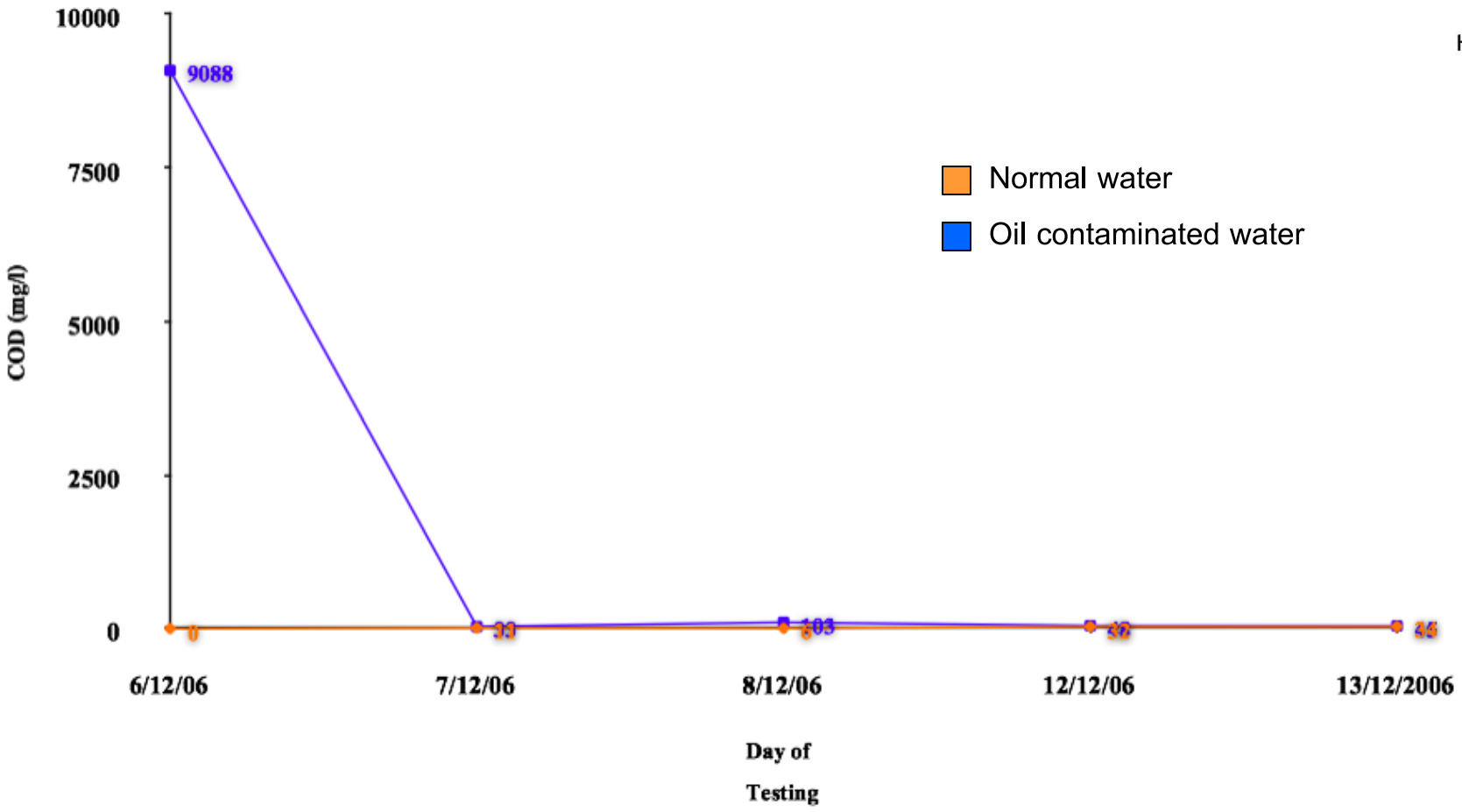
Conclusion

As the analysis result, the last sample, COD value of wastewater is nearly the natural water and has in the range of effluent standard water (COD 100-120 mg/l).

Tested by Kanchna B.

Approved by Nichanan T.

The result of testing COD



From graph, comparing of COD measure between normal water and oil contaminated water, you can see the measure of COD in oil contaminated water at the first day is high up to 9088 mg/l but after using KEEEN Product, the COD measure is decreased until almost like the normal water.

The Result of Testing in Water

KEEEN

After using KEEEN Oil Spill Control for around 1 week, the results below showed it had good efficacy:

- The amount of COD decreased
- The color of water was clearer
- There was no odor at all

After this 5 hour remediation, many of the fishes came back to their old habitat. These fish however, should not be consumed as they would have ingested toxins (heavy metals that cannot be removed by bioremediation method) in the water.

KEEEN Testing in Soil

The oil contaminants in the soil were the source of the problem on a higher altitude compared to the pond causing the degenerated organic substance to flow into the pond. The Oil Contaminated area was about 50 square meters.

Need of OSC and water

- The surface area of contaminated soil = (22/7) X 4m X 4m = 50.3m^2 or 50m^2
- The amount of water consumption to treat (spray) the soil = 2.5 X 50 m^2 = 125 L (approximately), means that only 3.125 liters of OSC is needed (1:40)
- Mix OSC with the 125 liters of water (calculated from water consumption for <u>treating soil</u> based on a ratio of 1 m^2 requires 2.5 liters** of water)

** For general cleaning, the ratio should be 1m^2 of area to 1 liter of water.

Procedure

1. Set up sprinkler at 4 locations to sprinkle water in soil for 30 minutes and adjust high pressure at the right rate to avoid excess spreading of oil contaminant.
2. Spray KEEEN OSC mixed with water to a ratio of 1:40 (125 Liter) on the area of oil contaminated soil.
3. Open sprinkler system at intervals of 10 hours
4. Use a tractor to scarify the soil until the soil is remediated.
5. Test with methanol wall wash method.

Soil cleaning procedure

KEEEN

1. Feature of Soil before remediating

2. Sprinkle the water by Sprinkler for 30 minutes

3. Spray KEEEN product in soil

4. Sprinkle the water again with sprinkler after 10 hours

Soil cleaning procedure

Feature of soil after sprinkling water and using KEEEN product

Tractor

Test by methanol wall wash method

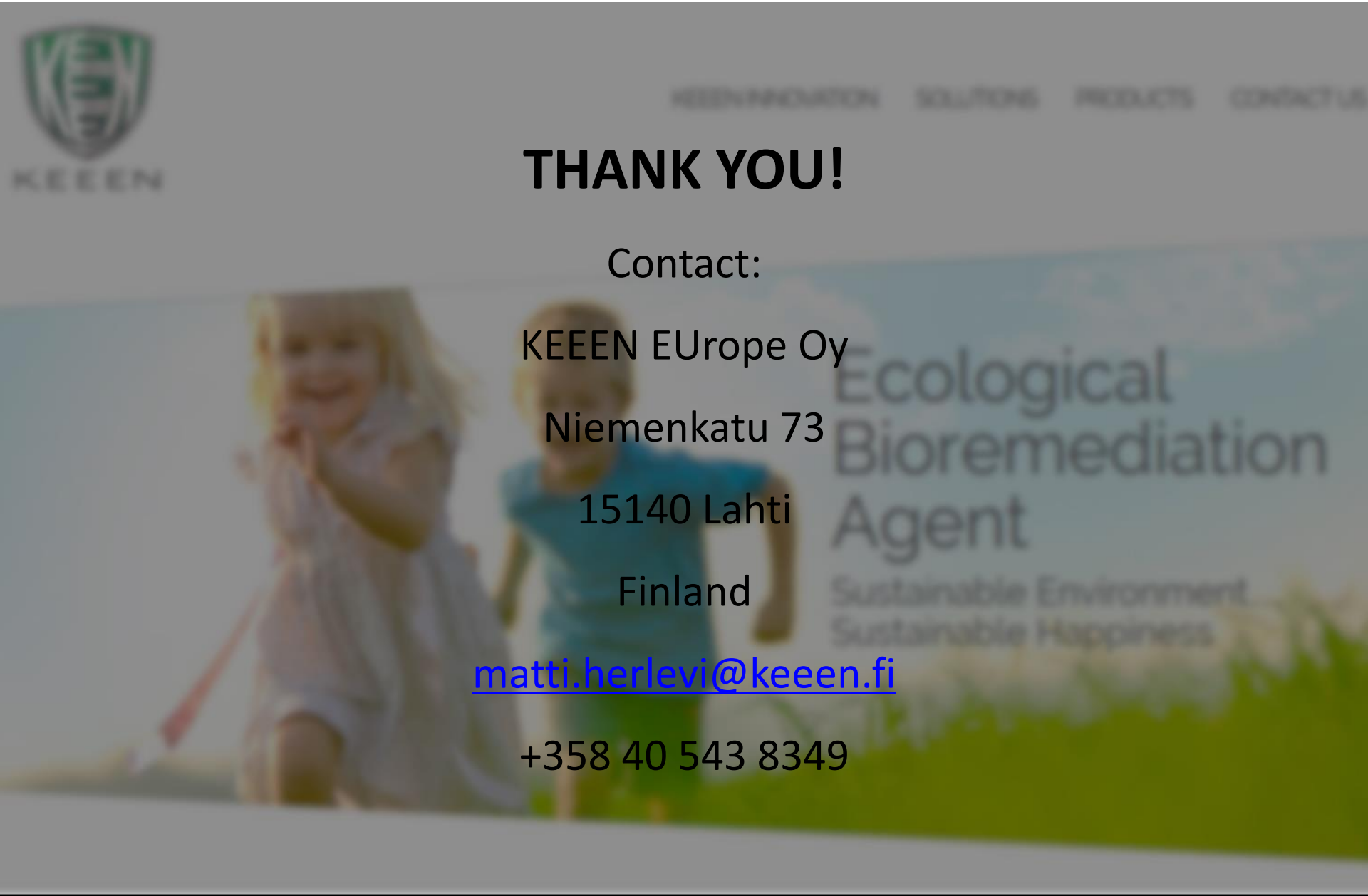
Test of the rest of oil contaminated on soil

The testing result in soil

KEEEN

After using KEEEN the results of the good efficacies are as below:

- Soil became normal or looked almost as the soil in the surrounding area.
- There appears to be no oil contaminants in the soil.



THANK YOU!

Contact:

KEEEN EUrope Oy

Niemenkatu 73

15140 Lahti

Finland

matti.herlevi@keeen.fi

+358 40 543 8349