



Finding leaks and blockages

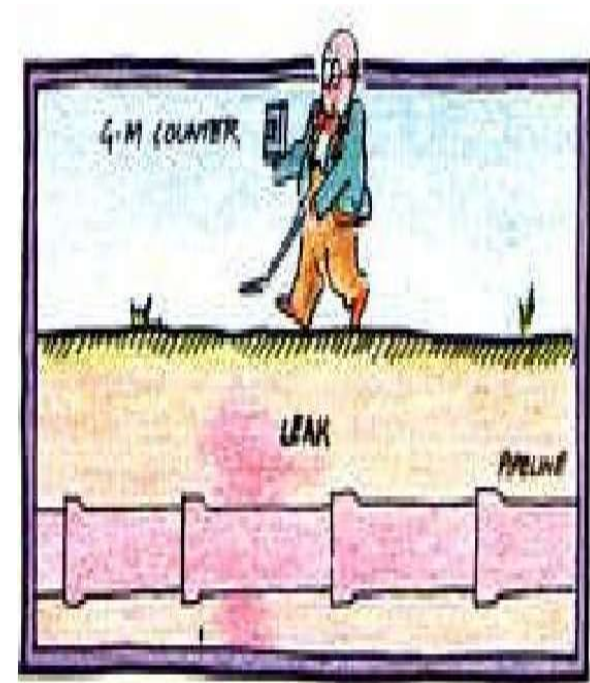
Dating rocks

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Finding leaks and blockages - Industrial traces

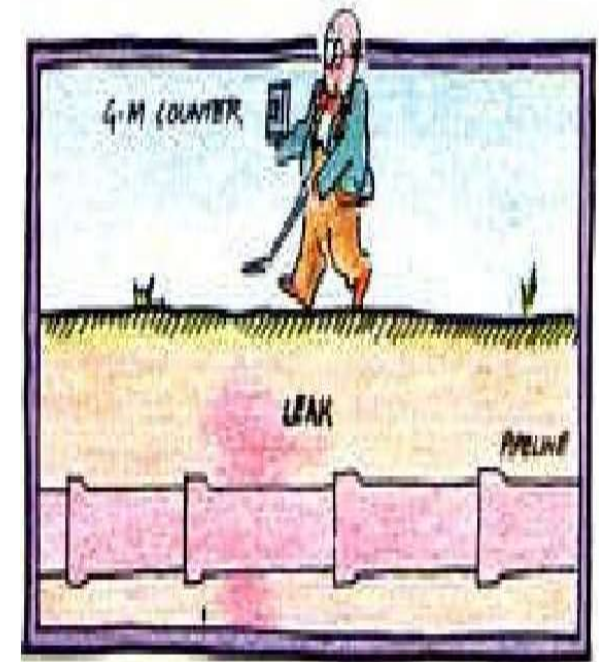
A leak or blockage in a pipe may be difficult to find, particularly if the pipe is buried underground.

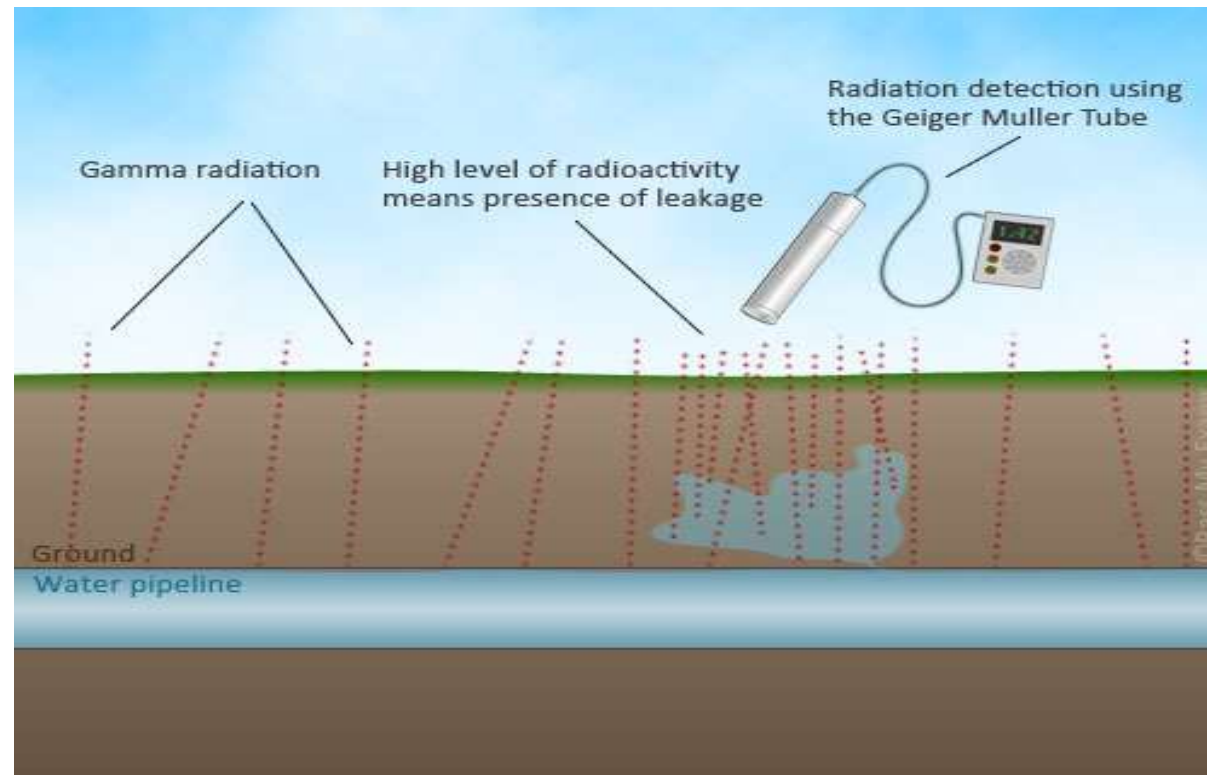
Substances that emit gamma radiation are used as tracers.

To find a leak or blockage, the radioactive material is put into one end of the pipe.

A radiation detector outside the pipe or above ground is used to track its progress through the pipe.

The leak or blockage is discovered by finding where amount of radiation detected decreases.





The use of a radioisotope that emits beta radiation is important as beta radiations have the correct penetrating power to travel through the soil to give a measureable reading above ground.

An alpha source would be of no use as the alpha radiations would be absorbed by the soil.

Gamma rays on the other hand have too much energy and would pass through the walls of the pipe.

It is important to use a radioisotope with a half life of a few hours or days.

This is so it remains long enough for the leak to be detected but not too long that it may pose a safety or health risk.

Sodium 24 is an example of a radioisotope used in leak detection. It has a half life of about 15 hours and emits beta radiation and gamma radiation.

Dating rocks

Radioactivity can be used to date rocks.
Rocks often contain traces of uranium.

This is unstable and eventually decays to lead, which is stable.

The age of a rock can be calculated if its ratio of uranium to lead is known.
The older the rock, the lower its uranium to lead ratio.

Young rocks have a high uranium to lead ratio.



The half-life of uranium is 4.46 billion years. If a rock has a uranium to lead ratio of 1:1, one half-life must have passed .

Time	Percent of uranium	Present of lead	Uranium:lead ratio
0	100	0	1:0
After 1 half-life	50	50	1:1
After 2 half-life	25	75	1:3
After 3 half-life	12.5	87.5	1:7