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Data trends

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The capacity of speed

Unbelievable … the amount of data that we can store on a single piece of recording media (disk, tape, thumb drive, etc.) just seems to keep getting larger. Will it ever end?

For many years, data recording technology in the oil and gas sector has been dominated by IBM. Starting with the development of the 9 track tape in the 1960s, followed by the closed cartridge technology called 3480 in 1984, IBM has been the leader in the seismic recording industry for as long as I have been alive.

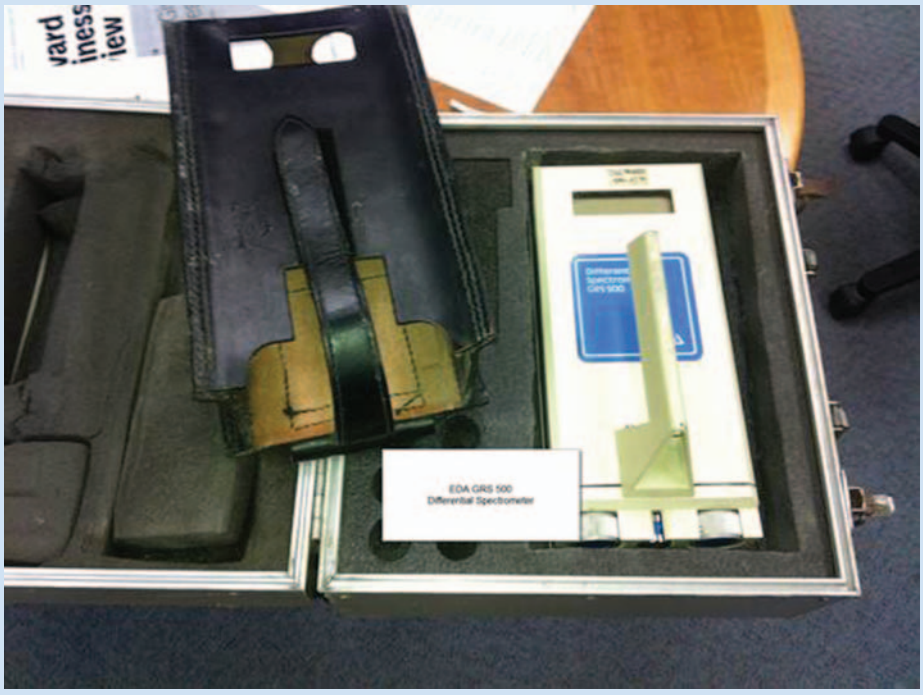
The 3480 was the first of a long line of closed cartridge recording media that still has direct descendants in the market place today. Not too many companies can claim to have invented a device in 1984 and can still show that a current modern version of what is essentially the same thing is still being developed and used commercially over 30 years later. The first telephone looks nothing like my current one, the phonograph looks nothing like my Spotify account, etc. But with this media type (unless you know a lot about it), you would be hard pressed to tell the difference between the one created in 1984 and the one being used today in 2016 (from a visual point of view anyway).

What has changed, however, is the storage capacity of the media as it has moved from one generation to the next. In fact, this IBM technology has had about 10 generational releases and has increased in capacity some 5000 times since it was invented while, amazingly, it has not really changed in size. The 3480 in 1984 could store 200 MB; however, its latest descendant, the 3592E08, can now hold 1 250 000 MB (10 TB). This increase in capacity was achieved by increasing the number of tracks written to the tape, while at the same time increasing the density of the bytes being packed into each of these new these tracks.

Whilst this capacity change is quite incredible, there is one significant feature of the media that is not so incredible, and almost all recording technologies suffer from the same shortcoming. That shortcoming is the speed at which you can read the data from the tape. Between the 3480 and the 3592E08, speed has only increased from 3 MB/s to 300 MB/s (a 100 times increase), while at the same time capacity has increased 5000 times. Maybe I should be grateful with the capacity increase and ignore the performance issues? No – not me! I like to complain too much to let this one slip by.

So, as an analogy, we are saying that 130 years ago the first car was invented that had a petrol tank that held about 7 litres of petrol and could drive at 16 km/h. And, through evolution, we have essentially created a car with a petrol tank that holds 35 000 litres of petrol but can only go at 160 km/h. Picture a Honda Civic with a petrol tank the size of a semi-trailer tanker. You won't go very fast, but the upside is that you will be able to drive around the world about 75 times before you need a refill! I mean, what is the point?

3480 tapes could be read in less than 3 minutes, but it takes more than 20 hours to read the 3592E08. If I wanted to look at some data in 1980 I only had to wait for 3 or 4 minutes. Now I have to wait hours. Are we really better off just because the tapes hold more?



This photo shows one type of hand-held differential spectrometers from the ASEG historic equipment collection. Unlike scintillometers, which measure total radiation above a particular energy level in the gamma radiation spectrum, differential spectrometers measure the energy within bands, or windows. In geophysical applications windows are chosen that signify the three standard elements traditionally measured in airborne radiation surveys, namely uranium, potassium, thorium and also the total count. All spectrometers consist of electronic analysers and detectors. The detectors for geophysical use are usually crystals that react to gamma rays impinging on them by scintillating. These scintillations are measured by photo-multiplier tubes. The crystal detectors vary in size from just a cubic centimetre or two for hand held units such as one illustrated, increasing to many tens of litres used in aircraft where the distance from the source is greater.