The Metal Magnetic Memory Method, known as MMM, is now worldwide spread for a great variety of applications. The technology is approved and currently used in many different markets for different kinds of equipment.

When applied for pipeline inspection, MMM is usually combined with pipelocating and GPS technologies. When buried, the operator locates the pipeline with a pipelocator (for example, RadioDetection, Ridgid, 3M or others), inspects the pipeline using MMM equipment and records GPS coordinates along the segment in order to locate anomalies for further action (dig verification trenches or even provide maintenance to the pipeline).

For long pipelines, such a process can be improved to reduce time spent for inspection (reduction of costs) and provide results for the customers: more reliable reports in terms of anomalies location.

Our experience has shown that one operator can conduct pipeline location and GPS recording if using the right equipment, while followed by the MMM inspector. No marks on the ground are needed and there is a great productivity improvement since all is done at once.

Fig 1. Operator using High Precision GPS (backpack) and Pipelocator at the same time:

Georeferencing for long distances
Not only that, but using high precision real-time GPS allows for submeter precision and recording of interferences, obstacles and pipeline depth (obtained from the pipelocator) directly on the GPS screen. Inspek’s usual North and East precisions varies from 0.2 to 0.1 meters and, depending on the situation, satellites or 3G (cellphone) networks are used for real-time coordinates. In very few cases, where there is no 3G network available neither satellite coverage, it is still possible to use post processed GPS coordinates (IBGE bases for Brazil).

With most commercial GPS equipment, it is possible also to record the terrain profile using Altitude information. This allows to check how the inclination can affect anomalies, for example, and to give the customer an even more complete report.
Fig 3. Example of georeferenced pipeline

Fig 4. Example of georeferenced pipes inside a petrochemical plant
One thing that should be noted is Inspek has adapted the MMM equipment in order to make the MMM operator work easier. For long distances the operator “pulls” the odometer wheel with a strong belt. This allows for a free hand and to make easier to go through difficult terrains or even obstacles.
Looking for an operation even more precise, Inspek has proceeded with an experiment based on replacing the distance measured by the odometer wheel by GPS data. The test consisted on using both MMM and GPS equipment on Timer Mode. This would allow for the anomalies to be even more precisely georeferenced and for the whole equipment to be lighter, easier to transport, terrain influence free and to have a better appearance overall.

Fig 8. Test with typical inspection setup

Fig 9. Experiment combining MMM and Georeferencing without the MMM odometer wheel
The data was combined via Excel. All lines of information obtained from the MMS file (exported to Excel) were then interpolated between GPS points (previous and posterior) in order to calculate distance using only GPS coordinates.

In average, the GPS equipment recorded one point for each 31.5 lines of MMM information.

Graph 1. Plot of MMM data using distance obtained from the odometer wheel

Graph 2. Plot of MMM data using distance obtained exclusively from the GPS equipment

Only further testing combining software and hardware analysis would indicate if a setup using the MMM and GPS equipment in one set could exclude the wheel on a real case inspection. The tests done by Inspek only theoretically indicate that such a combination is possible.