

## Casing Magnetization Service

### Service Overview

Vector Magnetics' Casing Magnetization Service is a cost-effective solution for increasing the detectable range of down-hole casing via passive magnetic methods. Whether as a contingency against a shallow blow-out, to allow detection in extended salt formations where Active Ranging methods are ineffective, or to aid in well avoidance in densely spaced fields; Casing Magnetization provides an additional margin of safety at little cost and no risk to the wellbore.

When performing casing magnetization services, Vector Magnetics LLC will:

- design a magnetization plan that optimizes detection range over the desired interval
- measure the initial magnetic field strength of the casing
- magnetize the desired casing to saturation
- measure the final magnetic field strength of the casing
- provide documentation on how the joints should be installed and the measured field strength of the joints post-magnetization

As part of the service provided, Vector Magnetics engineers will assist in producing a plan to determine the number and location of joints to be magnetized.

These plans draw from our 30+ years of experience as the worldwide leader in relief well planning, well avoidance, and precision well bore placement, utilizing both active and passive magnetic ranging (PMR) methods.

Each plan will be customized to the specific characteristics of the customer's project. The magnetization plan will consider whether there is a single target depth or multiple depths, and whether the target occurs at a casing shoe or mid-string. By placing magnetized casing joints in an optimal pattern, the detection range via PMR can be significantly increased. Vector Magnetics engineers use their unique experience in magnetic ranging to design a plan that best suits the customer's needs.

After developing a plan, the magnetization operation normally takes place at the customer pipe yard or workshop. Magnetization equipment utilizes industry-standard 220v power, and requires a clear workspace that includes lifting equipment and assistants to manipulate the casing and the magnetization coil.

Vector Magnetics engineers provide documentation in the form of a final report to demonstrate the field strength of the casing before and after magnetization. The report also details the order in which the joints of casing should be installed and in which orientation. All joints are clearly labeled with an identifying number and for magnetic polarity.

### Features

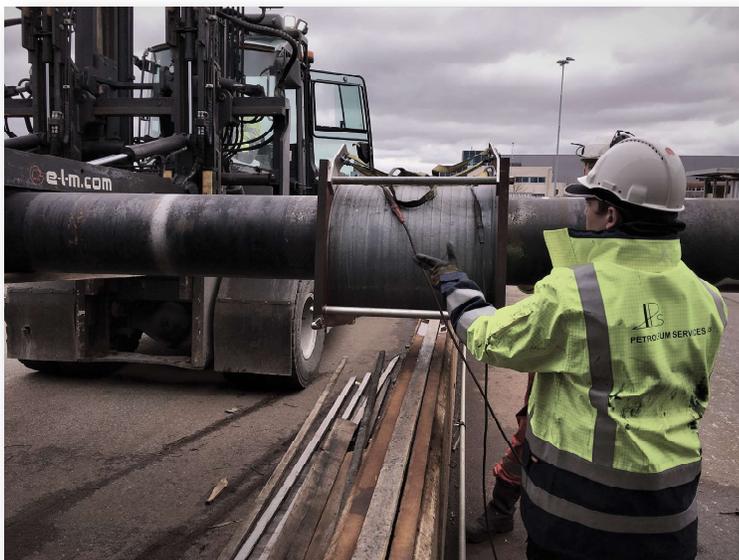
- Increases the detectable range of casing at the shoe or mid-string
- Effect is long-lasting and resilient to time and handling

### Benefits

- Greatly reduces the risk of an uncontrolled blowout or accidental intersection
- Cost-effective and portable to any customer location

### Applications

- Highly deviated shallow well-bores
- Drilling through extended salt formations
- Well avoidance



*Magnetization to saturation is achieved by exposing casing to a very strong magnetic field*

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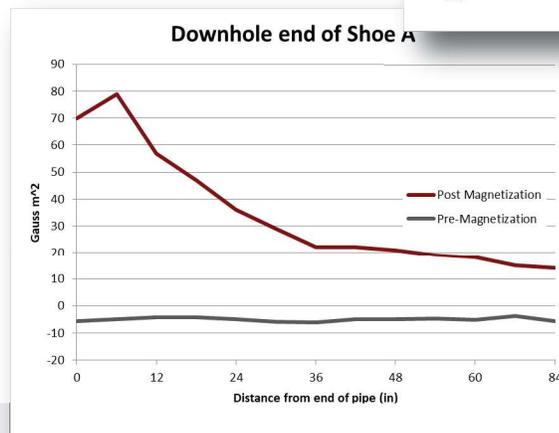
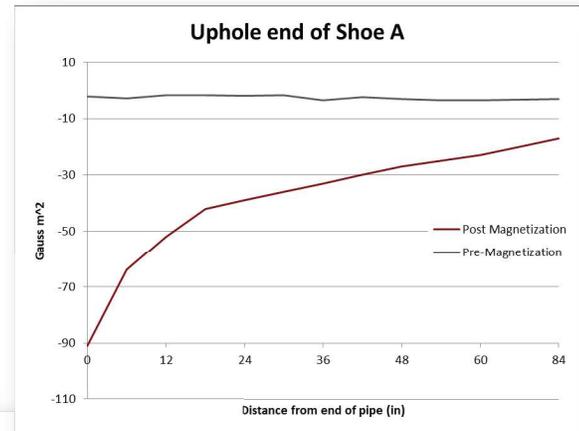
Service Overview

236 Cherry St. Ithaca, NY

### Requirements:

The following items should be considered when planning for the job

- The casing should not have any centralizers or oversize parts installed prior to magnetization
- Casing should be stacked on two stands, all arranged in the same orientation (i.e. down-hole ends points same direction) with adequate room to move casing around
- An overhead crane or forklift and operator should be available to lift the coil and casing. The casing must be lifted one end at a time during magnetization, and re-arranged on the stands during the operation
- 220-240V AC 30amp single-phase power is required. An extension cord of 50 feet or more may also be necessary (exact length dependent on the distance from wall power to the work area)
- An assistant should be available to aid in taking measurements, moving the coil, handling casing, etc.



Example of measured field strength; before and after magnetization

### Frequently Asked Questions:

**Why magnetize casing? Can't I use passive magnetic ranging (PMR) without magnetizing the casing?**

Without intentionally magnetizing the casing, one is relying on the random and unpredictable magnetization of casing when it was manufactured. While it is possible to use PMR to range to pipe without magnetizing casing, there is no guarantee the casing will be detectable using PMR at an acceptable distance. After magnetizing the casing, the magnetic field can be measured and one is no longer relying on chance.

**How much difference can magnetization make in PMR?**

Detection range can be increased up to 2x when compared to a casing shoe or 3-4x when compared to ranging to the middle of a casing string.

**What size casing can be magnetized?**

Presently we can accommodate casing sizes up to 22". For other sizes please inquire.

**Are there any special handling requirements for the magnetized casing?**

Our testing indicates that the magnetized casing is quite resilient both to handling and time. We recommend transporting the magnetized casing in a separate basket from other casing, to avoid exposure to any strong magnetic fields.

**Is the magnetization of the casing permanent?**

Field testing of magnetized casing joints at surface has demonstrated that the effect is long lasting.

**What are the power requirements?**

220-240VAC single-phase, 30amps.

**Where can the operation take place?**

Lifting equipment in the form of overhead cranes, forklift or other devices are required to manipulate the coil and handle the casing. Power is required for the coil and for a laptop, therefore, the work area should be protected from the elements as required for safe operation of electrical equipment. Operations normally occur at the pipe yard or company workshop.

**How long will this take?**

In our experience, we can magnetize between 10-20 joints of casing per day, given adequate assistance and no material handling or electrical setup issues.