

# Frequently Asked Questions IPI – PIT

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# Applus+ RTD IPI

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## A. Answers

### 1.0 Measurement

#### Q1.1 What measurement principle does the tool use?

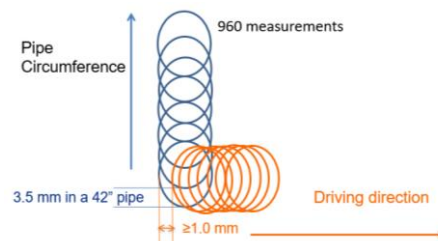
**A** The principle of the measurement is the use of a straight beam ultrasonic transducer in immersion technique. (Non-contact). The distance between the transducers and the pipe surface is between 25mm and 45mm in small diameter applications and approximately 90mm in the bigger diameters.

#### Q1.2 What is the accuracy of the measurement?

**A** The accuracy of the ultrasonic depth measurement is  $\pm 0,2$  mm. For more details see tool specifications, case by case.

#### Q1.3 What is the measurement resolution?

**A** Every 3 up to 4 mm of an axial movement of the inspection tool a measurement is made with the Ultrasonic system (Roto-Head). Since the transducer beam is 7.5 up to 10 mm on the pipe surface there is ample overlap. The ultrasonic system makes 960 measurements in the circumference during each axial movement. This applies for each system of 10 inch and larger.



#### Q1.4 Can the tool inspect gas lines?

**A** At this moment gas lines cannot be inspected with this ultrasonic system. However, Gas lines and gas risers have been inspected with these systems after they have been (partly) filled with a suitable liquid.

#### Q1.5 Is wax a problem for the measurement?

**A** The Applus+ RTD Pipeline Inspection Tool is a crawler type of vehicle. In contrary to regular intelligent pigs, which all use disks for propulsion, only the wheels of this vehicle are in contact with the pipeline surface. This means that the tool is not collecting any wax and debris that is present in the pipeline, which could eventually hamper the inspection. Also, for the ultrasonic measuring system a wax layer of up to 1 mm is not a problem.

#### Q1.6 What is the circumferential inspection coverage of these tools?

**A** Circumferential coverage of all the Inline Inspection Tools is 100% with ample overlap

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## 2.0 Launching

### Q2.1 How is the tool launched?

**A** The PIT system needs open access to the pipeline therefore the pipeline must be off-line, depressurised and opened. An Applus+ RTD handling station or launch-tray is used to keep the pipeline full of liquid and to allow that the tool simply drives into the pipeline. The liquid is essential to perform the ultrasonic inspection. (couplant!) At some occasions access to the pipeline was only possible sub-sea. For those situations we used special launching trays which are connected to the pipeline subsea and the tool drives simply from this tray into the pipeline.



### Q2.2 What is the length of the spool-piece to give sufficient space for the Applus+ RTD launch-tray?

**A** The standard Applus+ RTD launch-tray has a length of approximately 5.5 meter hence a spool piece with a length of 6 m is sufficient. However different launching procedures have been followed in the past hence with some adaptations smaller access points can be dealt with as well. Case by case the situation at site should be defined.

### Q2.3 Can the tool be launched under an angle or even vertically?

**A** Yes, the Applus+ RTD PIT can also be launched under an angle or even vertically launching is not a problem.



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### 3.0 Typical PIT Pipelines

#### Q3.1 Which customer Assets are typical PIT applications?

**A** Typical application for unpiggable tools is for pipelines that may have some of the following:

- ✓ Loading and Unloading Pipeline
- ✓ Jetty/Marine Export or Import Dock lines
- ✓ Buried piping
- ✓ District Heating
- ✓ Gathering, Transmission, distribution pipelines
- ✓ Cased River, Road or Railroad Crossings
- ✓ Cavern piping
- ✓ Pipe-rack piping
- ✓ Branch connections
- ✓ Through-wall facility penetrations
- ✓ Thermal pipelines (glass houses)
- ✓ Empty - or partly filled pipelines
- ✓ Storage piping



#### Q3.2 What is difficult in pipelines?

**A** The size, diameter, of the pipeline can be restrictive to crawler tools. To expand the inspection options for pipeline operators to know all physical characteristics that pose challenges to internal inspections:

- ✓ Multi diameter
- ✓ Short radius or heavy wall bends
- ✓ Fabricated ("mitre") bends
- ✓ Thick and thin wall pipe
- ✓ Repair sections
- ✓ Over- or under-sized valves
- ✓ Wax, scaling or other pipeline operator challenges
- ✓ Product

#### Q3.3 What are special bends and connection?

**A** Examples of challenging bends/connections:

- ✓ Back to Back bends
- ✓ Y-connection
- ✓ Short radius and thin wall bends
- ✓ Unbarred tees
- ✓ Fabricated ("mitre") bends
- ✓ Full bore off takes

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### Q3.4 Why are older pipelines difficult to inspect?

**A** Other restrictions on pipelines are related to how the pipeline was constructed, especially in older, longer pipes. Some of the restrictions are listed below:

- ✓ Cased road, rail, or river crossings
- ✓ Bore restrictions
- ✓ Steep and vertical sections
- ✓ Installations such as plug valves, dead ends, offtakes
- ✓ Exotic materials
- ✓ Coating or insulated, liners
- ✓ Unknown repairs
- ✓ Expansion sections
- ✓ Pipeline drawings not available anymore

## 4.0 Tool capabilities

### Q4.1 What bend radius can the tool pass?

**A** The bend radius that can be passed strongly depends on the pipeline diameter and the tool that is used. All crawlers are specially designed to deal with 1.5D bends. In special conditions 3D is preferred. There is a difference in passing capabilities between bends in the horizontal and vertical plane. Also mitre bends, dents or other obstructions in the pipeline can be passed but this sometimes requires special precautions to protect the cable inside the bends. To establish the inspect ability of a line it is important to know all features that exist in the line.

### Q4.2 Is there a limitation on the number of bends that can be passed?

**A** Yes, each bend generates friction on the cable, and this will limit ultimately the distance that can be travelled by the tool. Under normal circumstances the total bend radius that can be passed is at least 360 degrees (e.g. 4 times 90 degrees). Whether the tool will travel further strongly depends on the liquid inside the pipeline and the internal surface condition.

### Q4.3 Can the tool pass a valve?

**A** Valves can be passed but sometimes this requires special adaptations to the tool specifically designed for the valve type.

### Q4.4 Are pipelines with diameter changes inspectable with this system?

**A** Yes, diameter changes have been passed with this inspection vehicle.

### Q4.5 What pipeline length can this system inspect?

**A** In the bigger diameters this tool can travel up to 30 km inside a pipeline.

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**Q4.6 How long does an inspection take?**

**A** The speed of this inspection vehicle is approximately 500 metres/hour. Hence an inspection of a pipeline of 6000 m can take 12 hours going in and 12 hours coming back again.

**5.0 Pipeline preparations**

**Q5.1 How is access made to the pipeline?**

**A** Because liquid is needed inside the pipeline, access to the pipeline should be made at a high point or a high point must be created at the starting location. Open access is required to introduce the inspection vehicle into the pipeline. Many options for access are possible and have been used in the past.

**Q5.2 Can a pig launcher be used?**

**A** Yes, opening the launcher door and introducing the tool at this point into the pipeline is a possible launching scenario.

**Q5.3 What kind of pig receiving station is necessary?**

**A** This is an inspection vehicle with a cable, which is launched and received at the same side of the pipeline. This means that no facilities are required other than at the point of launching.



**Q5.4 Is cleaning necessary?**

**A** See also point 1.5. The requirements for the inside surface condition of the pipeline are not as high as for an inspection with a "free swimming intelligent pig". Under normal conditions flushing with a liquid velocity in excess of 1.5 m/sec will be enough to get the pipeline sufficiently clean for a reliable ultrasonic inspection.

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**Q5.5 Must the pipeline be empty during the inspection?**

**A** Since the system uses ultrasonics to perform the measurement a liquid that can act as a couplant is required in the pipeline. This can be a (light) crude oil, (sea) water, diesel, or other safe liquid.

**Q5.6 What pumping capacity is required for this tool?**

**A** These are all crawler type of vehicles which have their own electric drive mechanism hence there is no need for liquid pumping, liquid handling, or liquid storage during the inspection.

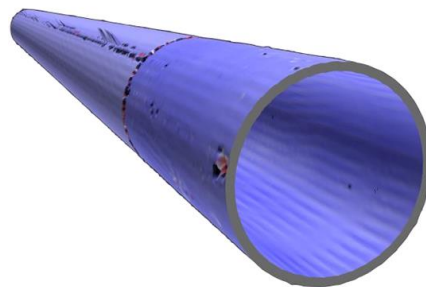
**6.0 Reporting**

**Q6.1 When can we expect any result of the inspection?**

**A** The Pipeline Inspection Tool is equipped with a cable containing fibre optical wires for data transmission, hence during the inspection the inspection data is transmitted to the top-side equipment for storage and result presentation. This means that during the inspection the measurement is monitored, and the condition of the pipeline is visible in real-time. Since the inspection result are immediately available, an on-site preliminary report is issued before the inspection crew leaves the site. This report already shows the most severe indications and important features that were detected in the pipeline.

**Q6.2 What kind of information will be in the report?**

**A** Sizing information like internal corrosion, external corrosion, lamination, ovalities, welds, bends, dents and (remaining) wall thickness all with clock position, distance from starting point, distance from previous weld, length and width of these features is available. Also, the Maximum allowable Operating pressure and the burst pressure of each defect is calculated according to the B31G standard. Several graphical presentations will be used to show the features detected in the pipeline in a comprehensible manner.



**Q6.3 Can a pipeline integrity report be made based on the results of this tool?**

**A** Yes, an integrity report can be supplied based on the inspection results. Applus+ RTD has also specialised departments for asset integrity management and is capable to provide this type of additional services. Optional assessments: Fitness for Service, Remaining life, Corrosion Growth.

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## 7.0 General

### Q7.1 What are the major advantages of a system like this?

**A** Only access on one side of the pipeline is required to perform the inspection. No liquid handling or diver support is required. The safety aspect of this system is a big benefit because the tool is connected to a special reinforced cable, and it can therefore always be retrieved. The measuring principle used is ultrasonics that means that the results are quantitative and available in real-time.

### Q7.2 In what type of pipelines can this system be used?

**A** In principle the system can be used in any pipeline when the line can be filled with a liquid.

### Q7.3 Can the tool get stuck?

**A** The speed of the tool is very low (up to 500 m/hr) and the weight is only 500 kg hence when it hits something in the pipeline the impact of such a collision is very low so the risk of the tool getting stuck is minimal.

### Q7.4 What if the tool gets stuck?

**A** When the tool gets stuck switching it in reverse is sufficient to retrieve the tool. When due to a power failure the tool breaks down all systems switch-off and the clutch and pressure arm disengages allowing for an easy retrieval by means of the cable winch.

### Q7.5 What kind of tools are available?

**A** The self-propelled PIT crawler system is available from 6" to 60". These systems can cover 1m up to 30km of pipeline. The even smaller PIT can deal with diameters of 4" to 8" and covers distances of 1 m up to 1000 m. Applus+ RTD also deploys other systems like the RiserPIT / CasingPIT which is designed for the inspection of risers (4" and up) using gravity. All systems use the same ultrasonic technology.

### Q7.6 Can I use the pipeline while the pipeline is inspected with this PIT system?

**A** No. During the inspection the pipeline is open hence no liquid flow is possible.

### Q7.7 What is the weight of the inspection tool?

**A** The weight of the PIT inspection vehicle is approximately 500 kg. The smaller PIT system has a weight of approximately 200 kg.

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