

ENDURO

Pipeline Services, Inc.



Enduro History

ENDURO Pipeline Services, Inc., from the beginning of the company in 1986 to the present day offers services and sales to assist our Oil and Gas Industry clients with their pipeline problems. The founders of *Enduro* believe in a hands-on approach to solving pipeline challenges, providing optimum solutions.

ENDURO offers to the industry a full line of pipeline cleaning pigs, realizing cleaning is an essential part of the internal integrity management of the pipeline.

The first tool developed by *ENDURO* was the analog Geometry Inspection Tool. This instrumented pig could detect dents, buckles, pipe wall changes, along with welds and valves. A modification was later added to the tool enabling bends to be detected along with the geometry.

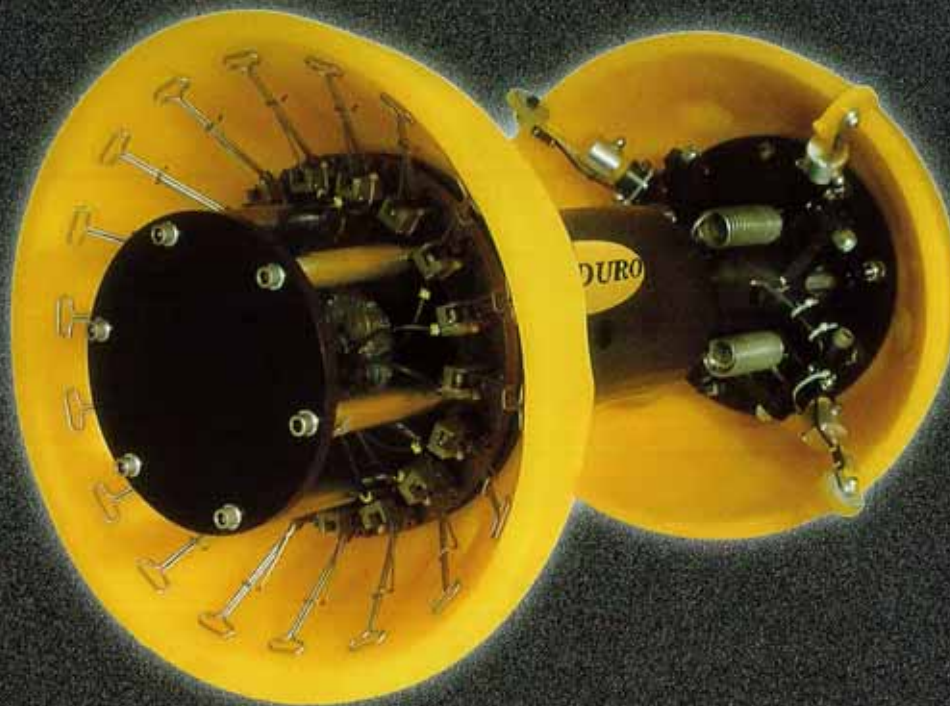
In 1998, the *ENDURO DdL™* Integrity Survey tool was developed by *ENDURO* and replaced the standard analog inspection tool. The *DdL™* incorporated geometry inspection, bend analysis and map production into a single pass through the use of digital memory. The digital storage ability also allowed the tool to be expanded into a multi-channel tool capable of logging radius point and diametrical point data, also allowing o'clock positioning of the anomalies being recorded. This first of a kind geometry inspection tool, placed the *ENDURO DdL™* Integrity Survey Tool at the forefront of the industry and became the industry standard. The *DdL™* computer flash memory, with advanced software, enabled a long line section to be measured with one pass, since the graph paper scale to pipe length was no longer the determining factor; line lengths of 300 miles can now be achieved. Since 1986 *ENDURO* has controlled over 85% of the North American geometry inspection market.

In 2005, *ENDURO* announced its *ENDURO DfL™* Magnetic Flux Leakage Survey tools - the latest development to become an integral part of day to day pipeline operational and maintenance activities. *ENDURO's* design team, with over 50 years combined experience in the development of pipeline corrosion inspection tools, has launched these second generation state of the art tools with numerous innovative features.



Welcome to the future... The future is now... The future is ENDURO.

Digitel Data Logger™



Unlike conventional caliper survey equipment, the *ENDURO* Digitel Data Logger™ (the DdL™) offers both radius point readings and diametrical cross-sectional analysis; multiple channels are provided offering the ability to log pipeline anomalies in clock orientation. Gyro inputs provide the ability to determine bend radii and bend direction (up from down – left from right); the angle of the bend is also determined.

Global Position System (GPS) equipment works well with the DdL™; excavations may be determined from logged GPS readings and given in GPS excavation points. With the reference points established, calculations are then made to determine the GPS coordinates and station at the anomaly location to be excavated.

The Above Ground Marker (AGM) is required on all DdL™ surveys. *ENDURO's* traditional AGM

equipment provides a reference location at specific points along the pipeline; these locations are logged directly to the DdL™ recorded data; the signal and location is then stored in the DdL™ for future reference and location assistance.

With the use of twin gyros on the DdL™, profiling and mapping of the pipeline is possible, as direction and angle readings are made on all bends. Bends are easily seen and may be used as reference locations when locating anomalies. *ENDURO's* DdL™ equipment is capable of traversing and recording bend radii of normal radius of 1.5 times pipe diameter; bends of 1 diameter have been logged with special tool adaptation.

The DdL™ survey tool is available in sizes 4 inch through 60 inch; all having multiple channels of geometric data and all anomalies logged in clock orientation.

Enduro Digital Flux Logger™

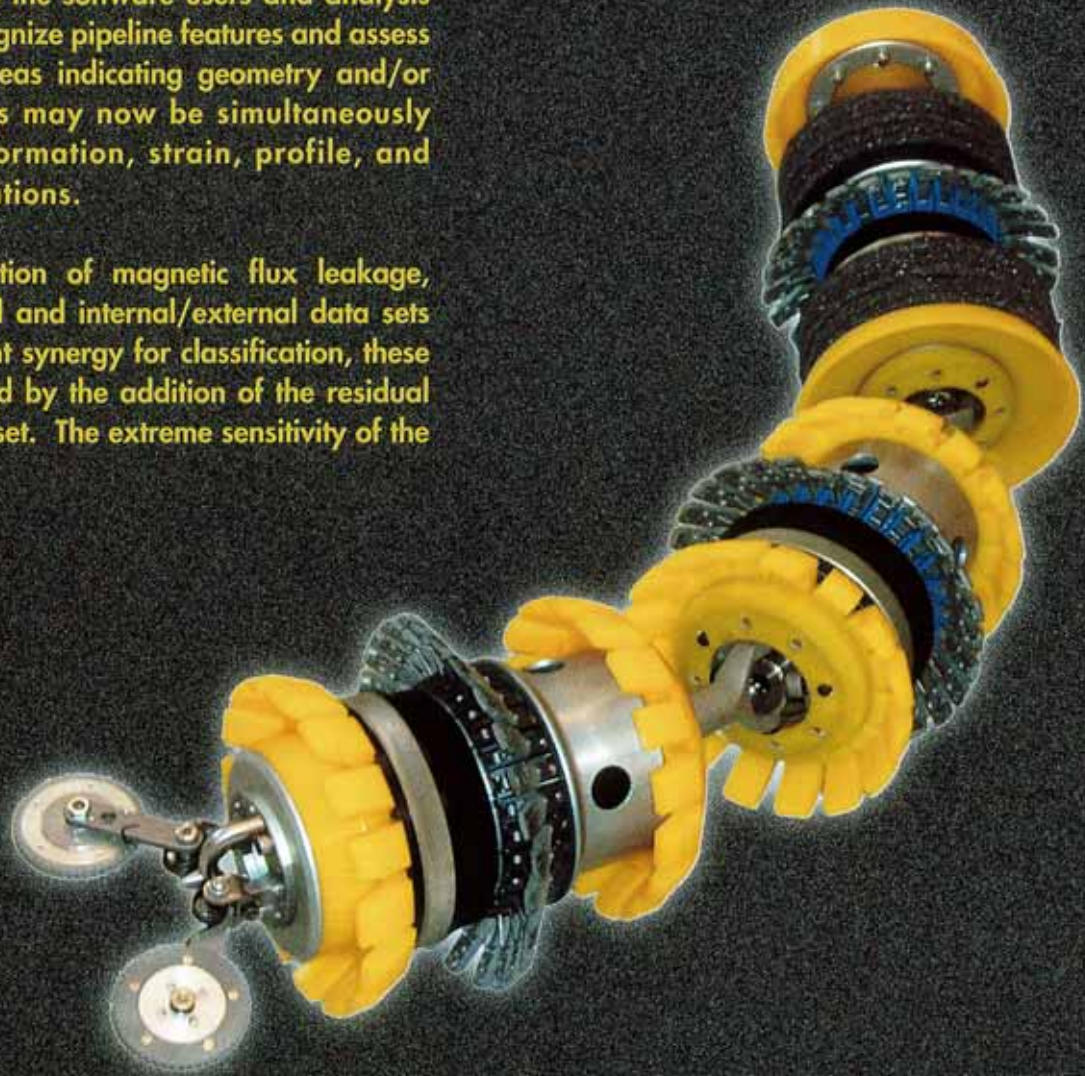
ENDURO has expanded its line of ILL tools to include the new Digital Flux Logger™ (Dfl™) tools. The new tools incorporate the ability to acquire data from several sources simultaneously in one pass, negating the need for performing independent surveys. Data sets for conducting metal loss, deformation, and inertial surveys, along with internal/external discrimination and residual field data are taken in a single pass of the inspection tools.

The Dfl™ uses the magnetic flux leakage technique, primarily to provide an assessment of metal loss occurring within a pipeline. Collecting metal loss, deformation, inertial, internal/external discrimination and residual field data sets concurrently greatly simplifies the process of identifying features and anomaly types. Processing and analyzing the closely coupled data allows the software users and analysts to more readily recognize pipeline features and assess conditions. Any areas indicating geometry and/or metal loss features may now be simultaneously evaluated for deformation, strain, profile, and permeability variations.

While the combination of magnetic flux leakage, deformation, inertial and internal/external data sets provides an excellent synergy for classification, these are further enhanced by the addition of the residual magnetic field data set. The extreme sensitivity of the

residual field component provides a means to identify and locate any areas possessing minimal deformation which would otherwise not be identified by conventional techniques.

The tools utilize some of the most advanced design, data storage and packaging techniques presently available, as evidenced by the diverse data sets being taken and limited physical size and weight of the tools themselves, typically less in length and weight than most presently being offered.



JUMP START your GIS MAPPING with a *current as-built* map of your system.

Features include:

- **Geospatial Data** needed for the National Pipeline Mapping System (NPMS).
- Varied attribute files and custom abilities for your GIS needs:
 - Hyper-link with your database files.
 - Direct Assessment - Record pipeline information, manage anomalies and provide reports on inspections, repairs and anomaly remediation.
 - Assess current condition of the pipeline and identify sections of high risk.
- Ability to interact with the existing NPMS mapping data files to assess current conditions around the pipeline and identify sections of higher risk:
 - Flood plains
 - Population density
 - Other High consequence areas

• Digital map background with pipeline routing



• Pipe Wall thickness with length of thickness run
 • Pipeline schematic of line features
 • Distances between line features

WALL THICKNESS	0+00	0+37.5	0+51
HORIZ. DIST.		37.5	13.5
SCHEMATIC			
HORIZ. DIST.			
	0+00	13.50'	0+14

• Mechanical damage feature points - with calculated GPS Point
 Enduro's PigProg will calculate GPS points for each event seen along the entire pipeline length.

ANOMALIES	ID - STATION	OVERALL - BESS/PCSD
	11-0105-085 - 1148	
	12-0114-1125 - 10199	
	13-0110 - 1148	
	13-0110 - 031 - 1148	

• Pipeline feature identification and line stations

FEATURES	ID STATION TYPE	CUST STATION
	F1-0+00-1-MANHO BECKER	
	F3-0+14-MAIN LINE VALVE	
	365+10	

• GPS point collection for related line features and pipeline bends

GPS	ID STATION	LAT LON
	01-0+00-36.77446,-107.98244	
	02-0+14-36.77448,-107.98244	
	265+10	
	03-0+48-36.77145,-107.98238	
	04-0+48-36.77452,-107.98231	
	365+40	
	05-0+85-36.77457,-107.98221	
	365+75	
	06-9+30-36.77086,-107.97983	
	374+25	

• Pipeline bend identification left, right, with angle and direction

BENDS	ID STA-ANG RAD	CUST STA
	B1-0+26-45.6° SD BT	
	B5-5+16-47.2° SD BT	
	B2-5+46-47.2° SD BT	
	365+27	
	B3-9+30-13.3° FL D LT	
	374+25	

Advantage Cleaning & Batching Pigs

4" - 60"



ADV-3D-2CC



ADV-2CC-BR



ADV-2CC-BRW



ADV-5D-2CC-BR

The *ENDURO* Advantage Pigs are steel bodied pigs ruggedly constructed to stand up to a wide range of pipeline applications. The Advantage Cup Pigs; Type ADV-2CC, ADV-3CC and ADV-4CC, are excellent batching pigs; used for condensation removal, purging and light cleaning. The Advantage Type ADV-3D-2CC and ADV-5D-2CC use a combination of cups and discs and are excellent for batching, removal of paraffin, and

cleaning common debris found in pipelines. Cleaning brushes and blades may also be added to enhance the cleaning effectiveness for those tough to clean pipelines. The Standard Advantage Pigs will traverse pipe reductions up to 25% with no damage to the equipment or the pipeline. Advantage Pigs can easily be fitted with Tracking Equipment when pig location is critical.

Bi-Directional Pigs

2" - 60"



BI-DI-4D



UreFlex-BRW



BI-DI-6D-BRW



BI-DI-6D

The *ENDURO* Bi-Directional Pigs are most commonly used as fill and displacement pigs during the hydrostatic phase of pipeline testing. These pigs can also be used for uni-directional applications when required. The *ENDURO* Bi-Directional pigs are available in a steel body design in sizes 2" to 60". The steel bodied Bi-Directional pigs are designed with replaceable components. These pigs are most commonly designed in either a 4 disc configuration or a 6 disc configuration. *ENDURO* tracking equipment may be installed in sizes 6" and larger. Smaller sizes require a special

body. The steel bodied pigs may also be equipped with optional gauging plates, ovality disc and magnetic cleaners. *ENDURO* also offers an all urethane Bi-Directional UreFlex pig in sizes 2" to 12". These pigs are designed in a 6 disc configuration. *ENDURO* tracking equipment may be installed in sizes 6" and larger. Wrap around brushes are available for the metal pigs in sizes 2" and above and can be added to the UreFlex pigs in sizes 6" to 12". Both Bi-Directional pig options are designed to safely traverse pipe reductions up to 25% with no damage to the equipment or pipeline.

UreCast Cleaning, Batching, & Displacement Pigs

2" - 24"



The patented *ENDURO* UreCast is a new concept in conventional pigging, offering the durability of a metal bodied construction pig and the convenience of a throw-away foam pig. *ENDURO's* UreCast design simplifies pig selection and operation for the pipeline operator. The *ENDURO* UreCast has been designed to accomplish all pigging tasks relating to cleaning, batching, purging and surveillance tracking. The multi-featured *ENDURO* UreCast incorporates a unique cup and disc combination which provides the

optimum sealing and scraping action. It also can be fitted with a brush kit. The UreCast features a hollow body for transmitter mounting. The *ENDURO* UreCast urethane is formulated to the highest quality standards providing the most abrasion resistant qualities possible. The UreCast construction is completely maintenance free. All cups and discs are formulated from 85 durometer shore A scale urethane. Other hardnesses are available for special applications.

UreFoam Pigs

2" - 60"



Silicon Carbide Grain



Scrub Brush



Criss-Cross Coated



Bare Swab

The *ENDURO* UreFoam Pigs are offered in a wide variety of configurations for every imaginable foam pig application. Available in sizes 2" to 60" for both steel or plastic pipe. Available in light, medium, and heavy density foam, the *ENDURO* foam pigs

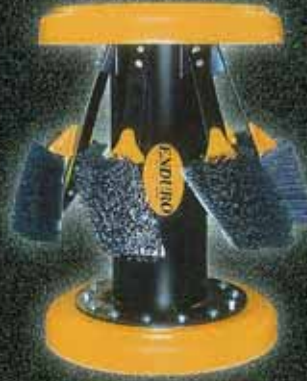
are offered in the Bare Swab, the Urecoat Criss-Cross, the Spiral-Wrapped Scrub Brush, the Spiral-Wrapped Carbide, and the Criss-Cross Silicon Carbide configurations. When low cost foam pigs are required, give the *ENDURO* UreFoam pigs a try.

Standard Scraper Pigs

2" - 36"



STD-4SC



STD-2SC-BR



STD-1D-3SC-MG

The *ENDURO* Standard Scraper Pig offers the user a heavy-duty pig that can be used in either a cleaning or displacement application. The Standard Scraper Pig utilizes an economical, heavy-duty cup which gives the user extended wear life, good sealing ability, and excellent scraping action. The Standard Pig is equipped with four cups; however, multiple cup

and disc options are available upon request. This pig can also be supplied with cleaning brushes and blades, gauging plates and magnets. *ENDURO's* Scraper Cup Bolt Pattern is standard throughout the industry and therefore may be used as a replacement cup on existing similar pigs manufactured by others.

Dual Diameter and Multiple Diameter Pigs

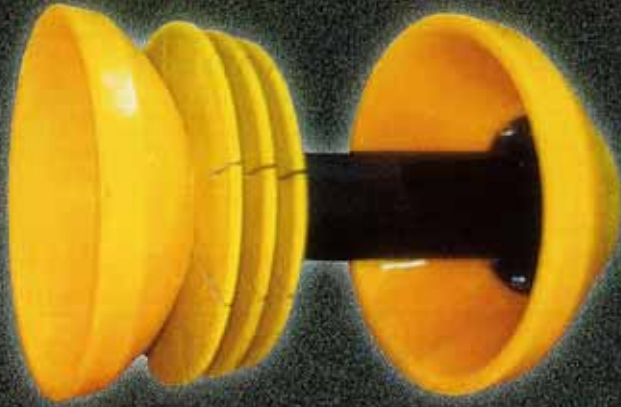
Custom designs available for almost any size



ENDURO has developed a new slotted cup and slotted disc designed for pigging dual diameter and multiple diameter pipelines. The special sized cups and disc have proven to minimize by-pass and provide a near constant seal in dual diameter and multiple diameter pipelines. Specially designed pigs can be manufactured to accommodate brushes and/or magnets for pipelines as small as 3" X 4" with 1.5D bends.

Gauging Plates

2" - 60"



If determination of mechanical pig passage is required, *ENDURO* can custom manufacture gauging pigs to indicate varying pipe transitions or anomalies or to determine the presence of varying bend radii. To determine the extent of circumferential damage, the plate is sliced into segments so that individual quadrants may be sized.

The pig shown is a typical conical cup design having three gauging plates; in this case all three plates are of a different diameter and are covered with urethane, an available option ideal for internally coated pipelines. The *ENDURO* gauging pigs can be custom designed in any metal pig body configuration.

Pig Links Cleaning Pigs

Customized Lengths



ENDURO introduces a new concept in pipeline pigging. Both flexible and versatile, the Pig Link concept allows many and varied configurations and adaptations of cups, discs, and body links - most any design you may conceive, can be built with Pig Links.

The flexibility of the polyurethane body link allows the pig to pass bend radius as small as one diameter (1D bends are possible) even when attached to additional link sections for added length and design variations.

The model above is a link of 3 body links connecting a series of 9 discs and 2 conical cups into a tool approximately 48 inches in length.

Excellent for:

- Nitrogen Purges
- Line Cleaning and Scraping
- Batching
- Hydrostatic Fill and Displacement



Para-Fin Plow Pig

10" - 60"



Our Parabolic Scraper "Para-Fin" supplies nine times as much scraper force against the pipeline wall as the conventional scraper plow having three flat bars. *ENDURO* reduced the total surface area of the Para-Fin scraper by applying a parabolic design to a *molded urethane* plow head.

Tapered parabolic design provides for a sharp urethane edge against the wearing surface of the pipeline and maintains the same contact point through miles and miles of pipeline. Field reports on the Para-Fin are fantastic and the *95 Shore A* urethane is extraordinarily tough and nearly impossible to wear out. The Para-Fin can be designed to fit almost any Advantage Pig configuration from 10" and above. The Para-Fin can also be designed to fit most dual-diameter pigs from 10" and above. The spring mounted Para-Fin and spring mounted block brushes are interchangeable, providing the user with both a blade and brush body.

Enduro Pig Popper®

New **LIGHTED** feature now available!

2" - 60"



The *ENDURO* Pig Popper is an intrusive pig signal that is manually reset once it has been tripped by a pig. The *ENDURO* Pig Popper is available in several different options. Extensions are available in one foot increments for buried pipe locations. All units are also available in a lighted version. The *ENDURO* Pig Popper is designed to be fitted on most existing 2" fittings.

Manual Visual alert, Electrical alert
and Electrical/Manual Visual alert.

Pig Locating and Tracking Equipment



Geophone

Digitel™ Walk-around

Dual Geophone

Audible Amplification System

Allows the tracking personnel to detect the pig by amplification of normal noises created by pig passage. *ENDURO* offers a single probe unit and a dual probe unit. The dual probe unit allows the tracking personnel to determine if the pig is approaching the tracking location or if the pig has already passed.

Tracking & Locating Systems

The Pig Locating Transmitter is placed inside the pig. The Transmitter, along with the Locating Receiver unit, allows the tracking personnel to track pig movement or detect pig stoppage. Pig Locating Transmitters are available for 2" pipelines and above with the battery life ranging from 60 hours to 740 hours. For tracking pigs 6" and above, *ENDURO's* Transmitters are designed with a pulse frequency switch which allows the tracking personnel to track two or more pigs at the same time and differentiate between transmitters.



Digitel™ Walk-around

Pig Locating Transmitters

ENDURO

Pipeline Services, Inc.

P.O. Box 3489, Tulsa, OK 74101-3489

1-800-752-1628 • 918-446-1934

Fax 918-446-8125 • www.enduropls.com

