**Proceedings of IPC2002:**
**International Pipeline Conference**
**September 29 - October 3, 2002 Calgary, Alberta, Canada**

# IPC02-27362

## PIPELINE ALIAS

## *A UNIVERSAL NOMENCLATURE SYSTEM FOR THE PIPELINE INDUSTRY*

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### ABSTRACT

Currently there is no universally accepted nomenclature system used in the pipeline industry. Typically each vendor or operator uses their own terminology based on relevant codes, training, and experience. This creates a problem when correlating Inline Inspection data with Non Destructive Evaluation and Metallurgical Sectioning results. This paper's intention is to introduce a classification system that is independent of both vendor & operator specific terminology. In developing this universal nomenclature system, the authors consulted various pipeline operators and related regulatory bodies, as well as other publicized nomenclature sources. Once all the terms were compiled they were then merged, classified, and indexed. This indexed classification system will reflect the abilities and limitations of the three inspection methods and how they relate to each other so that proper correlation can be achieved.

### INTRODUCTION

Bob Simmons has been an NDE technician for over ten years and has been involved with projects across North America in the detection, assessment and correlation of pipeline anomalies. Shamus McDonnell has worked in the North American pipeline integrity field since 1990 with experience in integrity surveys including: leak surveys, depth of cover, cathodic protection, inline inspection, coating condition surveys, and GPS surveys.

Because of recent concerns regarding the correlation of integrity data from various sources, a system to address the terminology used is discussed and a solution proposed in this paper.

### WHY THE SYSTEM IS REQUIRED

To increase the accuracy of pipeline integrity and specifically ILI (In-Line-Inspection) correlation, the introduction of a single universally accepted terminology database is required. Several standards or codes provide definitions and classifications of pipeline defects, however the primary fault with these systems is that they provide a multitude of different terms for a single pipeline feature or anomaly.

These terminology differences are often the result of technical background, training or inspection technology tolerances and limitations. For instance, external wall loss due to corrosion may simply be "metal loss" to a low-resolution magnetic flux leakage ILI tool. The same defect may be called "External Metal Loss" by a High resolution MFL (Magnetic Flux Leakage) ILI Tool, while NDE (Non-Destructive Examination) identifies and classifies the defect as "External metal loss due to corrosion".

In a recent integrity program, a defect was called out as a "seam weld anomaly" by a transverse field MFL tool. Excavation and subsequent NDE (using advanced ultrasonic techniques) characterized the anomaly as a "lamination". After being cut out of the line, and sectioned the metallurgical lab results characterized the same defect as "alloy segregation". The final results, although technically characterizing the anomaly similarly, were later perceived by the pipeline operator to be completely different and to lack correlation due to the various

naming conventions used to describe the same anomaly. By indexing all inspection results and call-outs an acceptable correlation can be derived.

## CREATING ALIAS

The first step was the assimilation of a library of terms used in pipeline integrity. The first source used to build the library was the HM integrity database and the RTD Integrity Database (RTD-PRISM).

From the **HM** integrity database

- **20** different pipeline operators
- **76** different pipeline sections from 3” to 30”
- **11** different ILI vendor's data
- **5** different ILI technologies
- **20,000** miles of pipeline ILI surveys
- **6,500** previous dig evaluations and repairs

From the **RTD** Anomaly Evaluation database (PRISM)

- **11,000** excavations
- **24,000** anomaly evaluations
- **30** different pipeline operators
- **5** different pipeline codes and recommended practices
- **5** different NDE technologies
- **5** different ILI technologies

Right of Way or above the line surveys such as Cathodic Protection, Depth of Cover, GPS and Coating Condition Surveys were reviewed to produce lists of the anomalies and specific terms used in reporting. Other references were also used to further supplement the library and provide additional details of each type of pipeline anomaly and feature including: API's "5T1 - Imperfection Terminology", ASME B31.4 Liquids, ASME B31.8 Gas, CSA's Z662, Pig Source's Glossary of pipeline terms, The Pipeline Information Data Dictionary, Various NACE resources, PODS, and C.E.P.A.’s recommended practices. Numerous pipeline operators and other pipeline consultants also contributed terms and suggestions.

The resulting list included well over 200 terms. The list was then grouped by type of feature or anomaly, resulting in 150 different types of anomalies and features. Of the 150 types, 45 items on the list had multiple names; some items had up to five alternate terms or names for the same item.

The combined library of terms was then indexed to create a system that would identify each item with a single unique index number rather than the multiple terms possible for a single item. As the indexing was applied, similar terms were grouped while others were eliminated. For instance, terms that were specific to the location or physical parameters of an anomaly or feature were removed, as were cumulative defects and trade name pipe fittings. Since a multitude of parameters and trade specific names could be used for a specific item, only the generic name for each item was used. The process of uniquely identifying anomalies grouped many terms, resulting in a significant reduction in the total list.

Indexing was assigned by first grouping the terms by their fundamental characteristics. Prior to ALIAS development no hard and fast rule could be found that divided and sub-divided the list logically, as it would be used in practice. Therefore the first task of ALIAS was the development of a set of guidelines that explained the logic for the grouping that was used. First, the list was divided into two major groups: "anomalies" and "features and fittings". The Anomalies group was defined as "*abnormalities or defects on, or impacting the pipeline or its immediate environment*". The Features and Fittings group was defined as "*Any engineered appurtenance, repair or modification made to or on a pipeline*".

A sub-division of the groups was then made to further divide items by more specific characteristics. For Features and Fittings the sub-division was based on specific characteristics and function, while the anomaly group was divided by specific physical characteristics and/or method of degradation.

The resulting index system classified anomalies and features by three levels of grouping before the unique item was identified. The groups were then numbered, with the unique items being given the smallest interval in the numbering index. The indexing could then be applied to any list of anomalies or features and fittings, permitting users to select or integrate their own custom terminology for each item and still retain the indexing numbers for consistency and universal correlation.

The three-tiered indexing system used to divide the groups was titled as "Classification", "Category", and "Type". At the “Classification” level there are the features and fittings class, and eight anomaly classes indexed on industry accepted terms as they relate to their fundamental physical characteristics:

1) Volumetric - Anomalies that alter the cross sectional area of the pipe wall.
2) Planar - 2D Anomalies that do not change the cross sectional area of the pipe wall.
3) Geometric - Anomalies that change the general shape of the pipe.
4) Geotechnical - Anomalies affecting the environment surrounding buried pipelines.
5) Cathodic Protection - Anomalies that alter the expected Cathodic Protection on a pipeline.
6) Coating - Anomalies in the coating on a pipeline.
7) Weld imperfections- Anomalies associated with a welding process.
8) Others - Anomalies or occurrences other than previously listed.
9) Features & Fittings - Mechanical appurtenances on the pipeline.

The “Category” level identifies each classification by specific characteristics or degradation mode / cause. An example using Volumetric anomalies is:

1) Construction
2) Corrosion
3) Mill Related
4) Mechanical

The “type” level indexes individual anomalies by physical attributes and inspection technique tolerances. Under the Corrosion Category there are four unique anomalies identified:

1) Corrosion Wall Loss
2) General wall loss
3) Isolated wall loss
4) Erosion Corrosion

Although generic terms are used in the system, the index number applied to each item with it’s definition is all that is required to identify a unique item in the list. The indexing system was designed using integers to expedite and facilitate easy integration into data management systems. Because the system utilizes the index number for the purpose of tracking and identifying the type of feature or anomaly, any term desired can be used for each index. The user can now customize the system with their preferred nomenclature, applying their term for any index and corresponding definition. Although using different terminology, data is still easily correlated with other sources of data by the index number and definition.

Consideration was also made to allow integration of additional “Categories” and “Types”, as they are deemed necessary. This resulted in the indexing of “Classifications” by thousands, “Categories” by hundreds, and “types” by ones and tens.

1000s = Volumetric

1100s = Corrosion Wall Loss

1105 = General Wall Loss

There were several terms excluded from the index system with specific factors used in identify anomalies that qualified for a unique index. Cumulative anomalies were not given unique indexes since nearly thousands of combinations could be derived, i.e. dent with crack, dent with wall loss, dent with gouge, etc. Location and size parameters are also avoided because of the large number of resulting possibilities and added complexity that would result. Thus orientation, distance, depth, length and width are not used to classify or identify anomalies. These parameters are intended to be kept separate from their index and name and be treated as supplemental data to the identification. A project has been initiated by the authors to develop a standard for documentation of size, position and location.

The resulting database indexed naming convention was called "**Pipeline A.L.I.A.S**" (**A**nomaly **L**ibrary for **I**nspection **A**ssurance **S**tandards). The system was proven and further enhanced by implementing it into the previous mentioned HM and RTD databases as well as client databases, ensuring no required terms were missed.

The **Pipeline ALIAS** system allows specific pipeline features and anomalies to be identified by an index rather than the multitude of terms that could be used to identify it. A complete list of the ALIAS indexes and default terms is located in Appendix A.

## CORRELATION OF DATA WITH ALIAS

Inspection technologies have specific abilities and limitations to make specific call outs when identifying pipeline anomalies. An illustration of the need for this system could be made with a low or standard resolution magnetic flux leakage ILI tool, which does not have the ability to determine whether a wall loss signal was internal or external. The pattern of the signal(s) and the location may be all that can be used to determine that the anomaly has the appearance of wall loss, likely due to corrosion. The anomaly would be assigned the index 1000, "Volumetric Defect".

Excavation and NDE with Ultrasonics could then determine that the anomaly was a single isolated internal wall loss pit, and it would be classified as 1110, "Isolated Wall loss".

If the section of pipe containing the anomaly was then cut out, and sectioned for further examination, the source of the wall loss could be further determined to be a "Mill Slug Void", and assigned index 1210.

The correlation of the results would show that the original ILI analysis did correctly identify the "Classification" as a 1000 series. The NDE further classified that it was an internal pit and assigned a specific "Category" that better defined the anomaly. Then the Sectioning conclusively identified the anomaly to be a Mill Slug Void 1110. All three call outs were all in the same Classification (1000 Volumetric), showing that the inspection techniques did correlate to some degree, but that the first two methods had incorrectly identified the category and exact type of the anomaly.

In the actual example listed at the start of this paper, a Transverse MFL ILI callout, NDE callout and sectioning result were all compared. Although there appeared to be a complete lack of correlation, applying the ALIAS index system actually

 

shows a high degree of correlation. The ILI call out was "Seam Weld Anomaly" which would have been classified as a 7000 category "Weld Defect". Despite the different wording, both NDE and Sectioning would have been forced to use the same index (2200), and a good correlation would have been made. Subsequently the ILI call would have been determined to be incorrect, while NDE and Sectioning did correlate.

## DIRECTION

The entire industry is being given access to the system through a web database located at www.PipelineAlias.com. The database was built to facilitate the system, allowing users to assign unique terms to be used in place of the default terminology, while retaining the same indexing for universal compliance. This web based database was made possible in part through a sponsorship from Agra Pipeline Professionals.

By logging on to the web site, users can view the ALIAS system and database, and also down load the complete list of indexed terms. Companies wanting to utilize the ALIAS system can create a company account that allows one administrator to have permissions to change the default terminology used for each index. All other users working for that company would log on and see the administrators terms used in the index rather than the default ALIAS terms.

## ADMISTRATION OF ALIAS

Daily maintenance of the ALIAS database and web site are being completed by RTD and HM, however a committee needs to be formed to respond to recommended changes, additions and omissions to the default ALIAS System. The purpose of the committee would be to ensure that the best interest of the user group (and the pipeline industry) is considered before changes are made. The committee should have representation from pipeline operators, ILI venders, NDE companies, and metallurgical companies.

## CONCLUSIONS:

The Pipeline ALIAS System can be easily implemented into any pipeline integrity data management system and will eliminate the problems associated with terminology mismatching. Pipeline operators, consultants, ILI venders, NDE specialists and metallurgical consultants can all access the system through an internet based database. Users of the system can select and input their own terminology for a specific item in the library, and still be assured that the indexing will keep their data compatible with other industry sources also using the ALIAS index system.


## ACKNOWLEDGMENTS

The authors would like to acknowledge the following people who contributed to the development and testing of the ALIAS System.

Dennis Schulze, Conoco

Tom Muras, Conoco

Rob Zmud, Colonial Pipelines

Andrew Albarda - HM (programmer for ALIAS Project)

Eric Pozniak - HM (programmer for ALIAS Project)

Mike Westman - HM (Programmer for ALIAS Project)

Tom Wicklund - BP

Martin Winspear - Wintech Inspection Services

Phil Nidd – Amec Pipeline Professionals Inc.

Andre Filiatrault - RTD

Denene Geissler - HM (Pipeline Integrity Specialist)

Melissa Clark, P.Eng. - HM (Pipeline Integrity Specialist)

Len Krissa, P.Eng. - HM (NACE CP Specialist)

Craig Malcovish, M.Sc., P.Eng. - Malaron Engineering Ltd.


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**APPENDIX A**

ALIAS List of Terms – June 26, 2002
*For a current list please refer to www.PipelineALIAS.com*

| CLASSIFICATION | CATEGORY | INDEX | TYPE |
|---|---|---|---|
| **Others** | Unknown | 100 | Other Feature/Anomaly |
| | External Metal | 200 | Close External Metal |
| | | 210 | Touching Metal Object |
| | Debris | 300 | Debris In Line |
| | | 310 | Mill Scale |
| | Equipment Malfunction | 400 | Tool Noise |
| | | 410 | Weld Seam Noise |
| **Volumetric** | Unknown | 1000 | Volumetric Anomaly |
| | Corrosion | 1100 | Corrosion Wall Loss |
| | | 1105 | General wall loss |
| | | 1110 | Isolated wall loss |
| | | 1115 | Erosion Corrosion |
| | Mill Related | 1200 | Mill related wall loss |
| | | 1205 | Inclusion |
| | | 1205 | Inclusion |
| | | 1210 | Mill Slug |
| | | 1215 | Seamless marks |
| | | 1220 | Increasing Wall Thickness |
| | | 1225 | Mill wall thinning |
| | Mechanical | 1300 | Mechanical wall loss anomaly |
| | | 1305 | Gouge |
| | | 1310 | Scratch |
| | Construction | 1400 | Construction related wall loss |
| | | 1405 | Arc Burn |
| | | 1410 | Puddle Weld |
| | | 1415 | Cable Burn |
| | | 1420 | Grind Mark |
| | | 1425 | Handling Mark |
| **Planar** | Unknown | 2000 | Planar Anomaly |
| | Cracks | 2100 | Crack |
| | | 2105 | Hook Crack |
| | | 2110 | SCC |
| | | 2115 | Hardness Cracks |
| | | 2120 | HIC |
| | | 2125 | Hydrogen Stress Cracking |
| | | 2130 | Sulfide Stress Cracking |
| | Lamination | 2200 | Lamination |
| | | 2205 | Non-Planar Laminations |
| | Mill Related | 2300 | Planar Mill Anomaly |
| | | 2305 | Lap |
| | | 2310 | Scab |
| | | 2315 | Seam |
| | | 2320 | Sliver |
| | | 2325 | Hard Spot |
| | | 2330 | Blisters |

| CLASSIFICATION | CATEGORY | INDEX | TYPE |
|---|---|---|---|
| **Geometric** | Unknown | 3000 | Geometric Anomaly |
| | Indentations | 3100 | Dent |
| | | 3105 | Multiple dent |
| | | 3110 | Buckle |
| | | 3115 | Flat Spot |
| | Bulge | 3200 | Bulge |
| | Mill Related | 3300 | Geometric Mill Anomaly |
| | | 3305 | Ovality |
| | | 3310 | Wrinkle Bend |
| | | 3315 | Eccentricity |
| | | 3320 | Bending shoe indication |
| | | 3325 | Expander Marks |
| | | 3330 | Roller Mark |
| **Geotechnical** | Unknown | 4000 | Geotechnical Anomaly |
| | Erosion | 4100 | Erosion |
| | | 4105 | Cultivation |
| | | 4110 | Wind |
| | | 4115 | Scouring |
| | | 4120 | Dredging |
| | | 4125 | Water Current |
| | Slope Related | 4200 | Slope Failure |
| | | 4205 | Avalanche |
| | | 4207 | Land Slide |
| | | 4210 | Mudflow |
| | | 4215 | Creep |
| | | 4220 | Cave In |
| | Ground Fault | 4300 | Ground Fault |
| | Soil Related | 4400 | Soil changes |
| | | 4405 | liquefaction |
| | | 4410 | solifluction |
| **CP** | Unknown | 5000 | CP Anomaly |
| | Induction | 5100 | Induced Current |
| | | 5105 | AC |
| | | 5110 | Foreign DC |
| | | 5115 | Telluric |
| | Equipment Malfunction | 5200 | Equipment Malfunction |
| | | 5205 | Rectifier Output |
| | | 5210 | Depleted Anode(s) |
| | | 5215 | Malfunctioning Insulator |
| | Environment | 5300 | Environment Anomaly |
| | | 5305 | Soil Properties (pH or resistivity) |
| | | 5310 | Temperature |
| | Galvanic Reaction | 5400 | Material Selection |
| | Shielding | 5500 | Shielding |

| CLASSIFICATION | CATEGORY | INDEX | TYPE |
|---|---|---|---|
| **Coating** | Unknown | 6000 | Coating Anomaly |
| | Disbondment | 6100 | Coating Disbondment |
| | | 6105 | Hydrogen Evolution |
| | | 6110 | Chemical |
| | | 6115 | Temperature |
| | | 6120 | Mechanical - Stress |
| | | 6125 | Soil |
| | Failure | 6200 | Coating Failure |
| | | 6205 | UV Damage |
| | | 6210 | Temperature |
| | | 6215 | Mechanical |
| | | 6220 | Manufacturing |
| | | 6225 | Non-Existing |
| | | 6230 | Coating Porosity |
| **Weld Anomalies** | Unknown | 7000 | Weld Anomaly |
| | Weld Material Defects | 7005 | Weld Crack |
| | | 7010 | Porosity |
| | | 7015 | Excessive Reinforcement |
| | | 7020 | Pin Hole |
| | | 7025 | Penetrator (s) |
| | | 7030 | Slag Inclusion |
| | | 7035 | Upset Under-fill |
| | | 7040 | Upset Wrinkle |
| | | 7045 | Contact Marks |
| | | 7050 | Stitching |
| | Incomplete Welds | 7100 | Cold Weld |
| | | 7105 | Lack of Fusion |
| | | 7110 | Incomplete Fusion |
| | | 7115 | Incomplete Penetration |
| | | 7120 | undercut |
| | | 7125 | Low Weld Cap |
| | Finishing Defects | 7200 | Inadequate Flash Trim |
| | | 7205 | Excessive Trim |
| | Alignment Problems | 7300 | Plate/Joint Misalignment |
| | | 7305 | Hi-Low |
| **Features & Fittings** | Unknown | 10000 | Feature or Fitting |
| | | 10010 | Unknown Feature |
| | | 10020 | Unknown Attachment |
| | Valves | 10100 | Valve |
| | | 10110 | Gate Valve |
| | | 10120 | Globe Valve |
| | | 10130 | Plug Valve |
| | | 10140 | Pressure Operated Valve |
| | | 10150 | Check Valve |
| | | 10160 | Stopple |
| | Joints | 10200 | Girth Weld |
| | | 10210 | Flange |
| | | 10220 | Insulation Flange |
| | | 10230 | Weld Plus End |
| | | 10240 | Tie-in Weld |
| | | 10250 | Spool Piece |

| CLASSIFICATION | CATEGORY | INDEX | TYPE |
|---|---|---|---|
| **Features & Fittings** | Reference Points | 10300 | Reference point |
| | | 10310 | AGM |
| | | 10320 | Magnet |
| | | 10330 | Pipeline Marker |
| | | 10340 | Aerial Marker |
| | | 10350 | Mile Post |
| | | 10360 | Station/Chainage Equation |
| | Off-takes | 10400 | Off-take |
| | | 10410 | Full Encirclement Tee |
| | | 10420 | Tap/Tee |
| | | 10430 | Split Tee |
| | | 10440 | Weld-O-Let |
| | | 10450 | Saddle |
| | | 10460 | Wye |
| | | 10470 | Diverter |
| | | 10480 | Drain |
| | | 10490 | Thread-O-Let |
| | Bends | 10500 | Bends |
| | | 10510 | Hot Bend |
| | | 10520 | HB < 1.5D |
| | | 10530 | HB 1.5 To 3D |
| | | 10540 | HB > 3D |
| | | 10550 | Cold Bend |
| | | 10560 | CB <1.5D |
| | | 10570 | CB 1.5 To 3D |
| | | 10580 | CB > 3D |
| | | 10590 | Miter Bend |
| | | 10595 | Elbow |
| | Facility Features | 10600 | Facility Feature |
| | | 10610 | Pipe Support |
| | | 10620 | Pipe Type Transition |
| | | 10630 | Transition Piece |
| | | 10640 | Reducer |
| | | 10650 | Launch/Trap Barrel |
| | | 10660 | Pipe Anchor |
| | CP Features | 10700 | CP Feature |
| | | 10710 | Cad Weld Patch |
| | | 10720 | Test Lead |
| | | 10730 | Anode |
| | | 10740 | Rectifier |
| | | 10750 | CP Attachment |

| CLASSIFICATION | CATEGORY | INDEX | TYPE |
|---|---|---|---|
| **Features & Fittings** | Repairs | 10800 | Repair |
| | | 10810 | Sleeve |
| | | 10815 | Sleeve - Type A (Lap Welded) |
| | | 10820 | Sleeve - Type A (Beveled Full Penetration) |
| | | 10825 | Sleeve - Type B (Lap Welded) |
| | | 10830 | Sleeve - Type B (Beveled Full Penetration) |
| | | 10835 | Patch |
| | | 10840 | Half Sole |
| | | 10845 | Weld Ring |
| | | 10850 | Non Metallic Sleeve |
| | | 10855 | Clamp-on sleeve |
| | | 10860 | Recoat |
| | | 10870 | Grind |
| | | 10880 | Puddle Weld |
| | | 10890 | Cut Out / Replacement |
| | Casings | 10900 | Casing |
| | | 10910 | Casing end |
| | | 10915 | Eccentric Casing |
| | | 10920 | Shorted Casing |
| | | 10930 | Casing Centralizer |
| | | 10940 | Casing Vent |
| | | 10950 | Casing Anomaly |
| | Buoyancy Controls | 11000 | Buoyancy Control |
| | | 11010 | Set-On Weight |
| | | 11020 | Bolt-On Weight |
| **Normal Pipe** | Unknown | 90000 | Normal Pipe |