Pigging Data Management Software Program Guide

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Middle East Pipeline Integrity Co. (P J S)

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1. Introduction

1-1.TEAM Introducing

TEAM middle East Pipeline Integrity was founded in 2005 with the goal of providing comprehensive services and operations related to oil pipelines and petroleum products, gas, water and sewage, including contracting and business in the construction, maintenance, operation, application change, improvement and control and engineering consulting, inspection of pipelines and transmission facilities and distribution networks and complex, refinery and petrochemical installations inside and outside the country.

The basic goal of TEAM as the one of the biggest companies in the middle east pipelines maintenance is to provide high quality services to its' customers. So in order to fulfill this important task, company has achieved ISO 9001 and ISO TS29001 certifications. Also obtaining approval from its' respected employers is a testament to this claim.

Along with the services the company offers, TEAM can provide various equipment such as pigging equipment, leak sealing and hot tap, a variety of specialized tools and related industries required materials that part of them is produced by TEAM and others is made by reliable and responsible domestic or foreign companies.

Variety of offering maintenance services has raised TEAM as the only Iranian company that presents "Pipeline Total Integrity services". The precision and accuracy in services and quality products to satisfy customers and meet their needs, respond quickly, providing innovative and appropriate solutions, appropriate price in comparison to foreign and domestic competitors, Employees' high sense of responsibility to conceded duties and having skilled workforces are prominent parts of the company.

1-2.Team Pig Tracking Device Introducing

TPL10GB Pig Locator

Pig tracking devices is used to know the pig location through pipelines or register it passes a certain point along the way. The importance of this device becomes apparent when pig get stuck in pipelines for different reasons and prevent fluid flow or at least decrease it. In this situation by this device it is possible to find the exact location of pig in little time and bring it out with appropriate methods. Because of working with different tracking devices over the years, TEAM has detailed familiarity with the strengths and weaknesses of them that it has managed to overcome many weaknesses in TPL10GB TEAM Pig Locator. These weaknesses can be pointed to these cases:

- Impossibility to automatically record geographical coordinates by tracking devices causes user errors when manually record them.

- Pigging operator reliance on coordinates written on pipeline markers (because of inaccuracy of registered distances on them) causes mistake in metering tracked points and as a result causes errors in predicting the time pig reaches the desired point.

- Errors in calculating the time pig reaches the user determined point because of his/her mistake in calculation.

- Discomfort and inflexibility because of necessity of being beside the device until pig arrives. (That can be dangerous or exhausting)

- Device heaviness for carrying on foot in long distances to find the exact location of pig that got stuck in pipelines.

- Cumbersome extension cord to connect the receiver chamber to the receiver antenna and possible deterioration of its sockets or cable disconnection.

- Using irreplaceable rechargeable batteries in the receiver and needing access to electricity in the vicinity of the pipeline for recharging them, that it is not always possible and the long time needed for recharging batteries are some other defects of this system.

- Impossibility of using tracking devices in rain or snow because of inappropriate environmental protection degree (IP).

TEAM TPL10GB Pig Locator by adding:

- GPS module to register geographical coordinates of pig tracking points.

- Custom-built software program for:

    - Calculating pig speed between two specific points.

    - Pig approximate time to reach the desired point.

    - Providing pigging control report at the end of operation.

    - Providing pig tracking point profile with accommodation ability on the map or aerial photos with geographical coordinates.

- Bluetooth module with 100 meters data transmission power. (To remove necessity of being beside the device)

- Filtering input signal to the receiver - main chamber – based on the specific shape of signal sent from the line. (To prevent incorrect pig crossing warning caused of annoying magnetic waves interference like Earth's magnetic field, mobile noise, etc.)

- using replaceable batteries that place in dedicated section easily. (To remove necessity of access to electricity for charging batteries)

- Providing IP65 protection degree for the receiver antenna and chamber. (Possibility of using the device in rain/snow)

- Removing extension cord between receiver antenna and chamber and replacing it with jack and sliding joint (easy transportation for operator and preventing problems of receiver antenna and chamber disconnection caused of damage to extension cord)

has overcome the mentioned weaknesses.

2. Software Installation

Insert TEAM pigging data management software program CD included with the device into your computer CD-ROM and run "setup.exe" file. (Below figure)

Installation includes 3 steps:

First installing "Microsoft.Net" software next "Google Earth" software and at last "TEAM pigging data management" software.

Each of above steps occurs one after another with some delay. If two first software are installed before, you will see a message that those software are installed before and if you agree with that, installation operation goes to next step.

After installation ends, restart your computer and the software is ready to use.

Notice 1: "Google Earth" software needs internet connection in first run, Iran map with average zoom is installed with the software in order to need less data to download if you have not access to broadband internet.

Notice 2: if you have any problem with software installation, feel free to contact TEAM support center.

3. Connecting Device to Computer

Shut down the device, open the screws of the batteries cover as below figure and connect USB cable included with the device from mini head to the section showed in below figure and from other head to USB port of your computer.

Notice: if it is possible please use back USB ports of computer.

4. Transferring Project Data to Software

If the device is connected to computer correctly, after turning on the device by holding the turn on/shut down key for 1 seconds, an image like the below right figure is shown on the device LCD and the "Enter" icon shine in the software main page (below left figure) that indicates the connection correctness and preparation of the device and software for data transferring.

By clicking the "Enter" key, transferring operation will start with some delay. Progress of projects data transferring from the device to the software and the remaining time is shown in a small window and the time can be various depends on the projects size and amount of registered points in memory of the software. After transferring projects data to the software the transferring window will be closed automatically and the projects names will be shown in the list of the first page of the software.

5. Introducing Software Pages and Menus

5-1. Software Menus

5-1-1. “File” Cascade Menu

- Open Project:

It is used to open a new project. (if using this option, all of current projects will be closed and if you changed current projects and do not saved them, it will be asked to save them and only new project will be opened)

- Add Project:

To add one or several new project(s). (If using this option, all of current projects will be remained and the new project will be add to the bottom of projects list)

- Save:

To save latest changes to a project in its old location and with its old name.

- Save as:

To save a project in a new location or with a new name.

- Export:

To transfer projects data as txt./xls. (file name extension) formats. (For Microsoft Word & Excel software)

- Import:

To transfer the saved data of the tracking device to the software.

- Exit

To exit the software and close all pages.

- Report:

To prepare pigging reports in software special file formats.

Notice: do as follow to see correct format of reports:

Word Option -> Advanced -> Show Document Content -> Numeral -> Context

By choosing reporting option, a page with two tabs named "Pigging Operation" and "Pig Situation" will be opened.

After filling out the form and clicking "Report" button, an address will be asked to save the report and after you agreed the saving location, related Microsoft Word file will be shown. The related report is adjusted so that the user is able to make any changes in its content.

5-1-2. “Tools” Cascade Menu

- Language:

To choose software language. (Persian or English)

5-1-3. “Help” Cascade Menu

- Help:

To access guide of working with software.

- About:

To access TEAM and software information page.

5-1-4. Page Menu

Includes shortcuts to “Open”, “Save”, “Save As”, “Import” and “Export”.

5-2. Introducing Software Pages

5-2-1. “Read Information” Page

Right click on the project name to show a menu with two below options:

- “Merge Points”: select multiple projects then select this option to merge their points.

- “Import Points”: by selecting this option it is possible to apply the edited path (in “Google Earth” software) on the original project in pigging software. (Refer to 5-2-2, “Edit Path” section)

This page has below columns as it appears in the above figure:

- Row: project entry order.

- Project Name: the name that user had chosen when added the project.

- Project Start Date: based on first registered point (normal, manual or mark) in the device from the project.

- Project End Date: based on last registered point (normal, manual or mark) in the device from the project.

- Project Length time (hour)

- Pig Moving Distance (Kilometer)

- Pig Average Speed (Kilometer/Hour)

- Details: by clicking "Show Details" button under the "Details" column, a page with 3 tabs as below figure with below properties will appear:

- "Pipeline Specification" tab, includes:

    - Operation Line/Region Name

- Line Length
- Line Size
- Line Volume
- Feed Type

- "Pig Specification" tab: user can attach/remove any type of photo, map or other document related to pig to/from project.

  - Pig type
  - Pic: before operation
  - Pic: after operation

- "Operation Data" tab:

  - Project Name: it is possible to change/edit project name here.
  - Feed Consumption Amount
  - Garbage Volume

Notice 1: you must save changes you made to details before exit. (Save button is below right edge of "Details" page.

Notice 2: all of information entered in "Details" section will be added to current project and will be kept as projects documents with related file.

5-2-2. “Project Points Details” Page

By double clicking on the project name, a tab with the name of the project will appear beside the “Read Information” tab that includes project point’s details.

Point Number	Date	Time	Latitude	Longitude	Altitude (m)	Launcher Pressure (bar)	Reciever Pressure (bar)	Speed (Km/H)	Note
1	2012/03/04	15:46:18	5125.2804E	3538.8651N	1141.2				AD.
2	2012/03/04	15:47:44	5124.9795E	3538.8537N	1136.9			20.26	JA
3	2012/03/04	17:00:51	5053.5023E	3441.009N	938.2			96.313	J A

This page includes point’s properties such as: point number, point registering date & time, point registering geographical location (Latitude, Longitude and Altitude), average pig speed from previous point to that point, user note about that point and two columns are predicted for launcher & receiver pressure at that point. User can see pressure-time graph (refer to 5-2-3) by entering mentioned pressures in corresponding locations of each point.

As you see in above picture, there are five buttons in below right of page, white “All”, black “Normal”, blue “Manual”, green “Mark”, red “Abnormal” that each one represents a group of points recorded during the project, by clicking each of them only its corresponding points will be shown. Here we introduce each of them:

Black points (Normal): points registered automatically during the project when pig crossing through the line.

Blue points (Manual): points registered manually by user during the project when pig crossing through the line.

Green points (Mark): points registered manually by user during the project to notation a specific geographical location.

Red points (Abnormal): points that because of some reasons such as lack of GPS antenna coverage at that point have no geographical location.

As you see in opposite figure, at below right of "Project Points Details" page, there are two buttons named "Speed Graph" and "Show".

Here we introduce them:

By clicking on "Speed Graph" button, below options are available:

- "Speed Graph": by selecting this option and clicking "Show" button, a tab named "Average Pig Speed Graph and Project Launcher/Receiver Pressure…" will appear that includes "Average Pig Speed-Time" graph and "Launcher/Receiver Pressure-Time" graph. (For more information refer to 5-2-3)

- "Height Graph": by selecting this option and clicking "Show" button, a tab named "Project Heights Graph" will appear that includes pipeline height profile based on line length. (For more information refer to 5-2-4)

- "Map": by selecting this option and clicking "Show" button, a tab named "Project Map" will appear that project path and registered points have been shown in it with their corresponding colors with help of "Google Earth" software. (For more information refer to 5-2-5)

- "Edit Path": by selecting this option and clicking "Show" button, "Google Earth" software will be opened in order to edit the project path. In this page, the project path and the registered points has been shown with their corresponding colors. (for more information refer to 6)

Notice 1: all information in the page is editable by double clicking on the desired info.

Notice 2: by clicking on each line (line will become blue), and holding "Delete" button on computer keyboard, that line will be removed.

Notice 3: to enter pressure in launcher/receiver pressure columns, if there are same pressures in an interval of points, it is not needed to fill out empty area; the software will automatically consider the last entered pressure as default for next empty points until it reaches a new pressure. For example if pressure is 100 for point 1 and it is 80 for point 20, the software considers 100 for all points between 1 & 20 to draw pressure graph.

Notice 4: it is obvious that only pig crossing points (normal and manual) have average speed.

5-2-3. “Project Average Pig Speed and Launcher/Receiver Pressure Graph” Page

As it mentioned in last section, by selecting “Speed Graph” option in “Project Points Details” page and clicking “Show” button, a tab will appear that includes “Average Pig Speed-Time” graph and “Launcher/Receiver Pressure-Time” graph. Here we introduce them:

- “Average Pig Speed-Time” graph

In this graph there are two lines with blue and red colors that present respectively “average point speed from previous point” and “all points’ average speed”. Obviously, it is only used pig related points (normal and manual) to draw this graph.

There are blue and black knobs on blue axis that are corresponding to pig crossing registered points. By holding mouse on these points, as it is shown in below figure, a floating box will appear that includes below information:

- Point registering hour

- Point registering type (normal/manual)

- Pig average speed up to that point (from previous registered point)

- Launcher pressure at that moment (if pressures are entered in project points details page)

- Receiver pressure at that moment (if pressures are entered in project points details page)

- Note (a text that is edited in project points detail page during or after operation)

By clicking on this points, "Project Height Graph" page will appear and graph will be locked on desired point (it means graph's zoom focuses on that point in order to user can find that special point between other points more quickly) that it will be explained in 5-2-4.

By holding mouse on the last point of red line, a floating box will appear that includes "Project Length time" and "pig average speed during the operation".

- "Launcher/Receiver Pressure-Time" graph

In this graph if user has completed the launcher/receiver pressures columns, it is seen two columns (green and yellow) that present respectively "launcher pressure" and "receiver pressure". By holding mouse on these columns, a floating box will appear that shows related point pressure.

5-2-4. "Project Heights Graph" Page

As you see in below figure, "Project Heights Graph" is shown with the help of project registered points (either normal or manual or mark).

Graph is consisted of black "Normal", blue "Manual" and green "Mark" points and a black line connected them to each other.

By holding mouse on these points, a floating box will appear that includes below information:

- Point registering hour

- Point registering type (normal/manual)

- Pig average speed up to that point (from previous registered point)

- Launcher pressure at that moment (if pressures are entered in project points details page)

- Receiver pressure at that moment (if pressures are entered in project points details page)

- Note (a text that is edited in project points details page during or after operation)

By clicking on mentioned points, "Map" page will appear and refers to corresponding clicked point on the map.

Notice 1: by right clicking on each graph, a floating window will appear as below figures that includes below options:

- Copy: provides a temporary copy of graph in computer memory.

- Save Image As: saves graph as a picture with different suffixes.

- Page Setup: provides settings for printing the graph.

- Print: provides the ability to print the graph directly.

- Show Point Values: enable/disable the points floating boxes.

- Un-Zoom: zoom takes a backward step.

Undo All Zoom/Pan: all zoom get back to the first stage.

- Set Scale To Default: all graph showing settings get back to the default.

Notice 2: It is possible to zoom in/out by rotating the mouse spool.

5-2-5. “Map” Page

As you see in below figure, traveled path and project registered points are shown on satellite maps which are provided by “Google Earth” software.

Marked points are consisted of black “Normal”, blue “Manual, green “Mark” and traveled path is shown with a white line. By double left clicking on map you can zoom in and double right click for zoom out. Hold left click on map and move mouse to move around the map. Also you can hold mouse spool and move mouse to change the view angle from the horizontal.

By left clicking on flag sign (which shows geographical location of desired point) a floating box will appear that includes below information:

- Launcher Distance: the distance between this point and first point.

- Average Speed: average pig speed at this point from previous point.

- Time Duration: operation elapsed time up to this point.

A Very Important Notice:

Although graph information are approximation, but with help of them and geographical maps, it is possible to export valuable information from the project. For example by putting aside the irrational results that can be due to user or device faults or natural (such as GPS antenna coverage error in rain or snow, lack/decreasing of antenna coverage or user not moving along the line during registering line profile to obtain exact length of line to calculate average speed and …), by comparing points average speed with total average speed, attending distances where pig speed was higher/lower than average speed with the help of pressure graph we can answer to this question: was this speed change because of change of pressure in launcher/receiver or not? Also to answer this question: was this change because of increase/decrease of this point height than previous point height or not? You can refer to height graph or be aware of natural effects in the vicinity of the line and desired point by geographical maps. It is obvious that the user experience and domination in pigging is very important and effective to use this information.

6. Editing Path in "Google Earth"

As you see in below figure, traveled path and project registered points are shown on satellite maps which are provided by "Google Earth" software.

For editing the path in "Google Earth" page, right click on the path name (that is same as project name) that is in "Places" sidebar and select "Properties" option. a new window will be opened.

At the same time the window is opened, on the white color of project path, some red points are seen that shows editing path is selected correctly. These red points are the points that formed the path which is detected by the device.

- Click on a point, that point will be selected. After that it could be possible to add a point between the selected point and the point after that by clicking on an empty area of map.
- To delete a point of the path, first that point should be selected. Then right click on an empty area of the map.

After editing the path, changes will be applied on the path in "Google Earth" software by selecting "OK" button. Right click on the project path name in the "places" sidebar and select "Save Place As" in order to changes to be saved on the file.

Notice: Selected file name extension have to be "kml" when saving. You should change file name extension from "kmz" to "kml" manually, if it is needed.

After saving the path in memory, right click on the project name under the "Read Information" page of pigging software and select "Import". A window will be opened. After selecting the edited path file, changes will be applied on the project.