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Submarine Pipeline inspection project

- During 2009 – participation in tender for submarine pipeline inspection
- In January 2010 - signing of the agreement for performance of the internal inspection of two pipelines on the sea bottom in Ashdod, and one in Hadera.
- The time table for the project: two weeks for each line in Ashdod, a two weeks break and two weeks for the line in Hadera, with a total project duration of two months.
- October 2010 - equipment alignment in front of Eskhol Power Station in Ashdod, for the inspection of the 16" & 24" pipelines. On October 17th 2010 the barge was positioned above the offshore end of the pipe line.
- On November 25th 2010 - the transition to Hadera took place for the pigging of the 32" pipeline.
- On December 18th 2010 - termination of the project.

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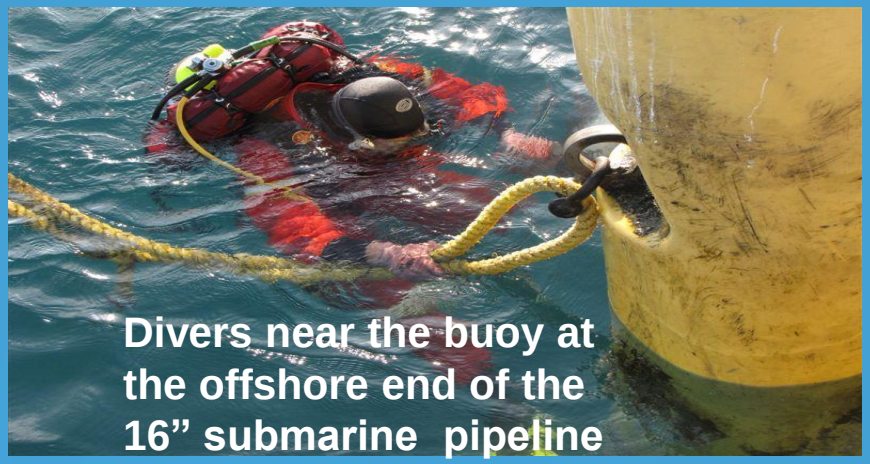
Preparations for the work opposite the Eskhol Power Station in Ashdod



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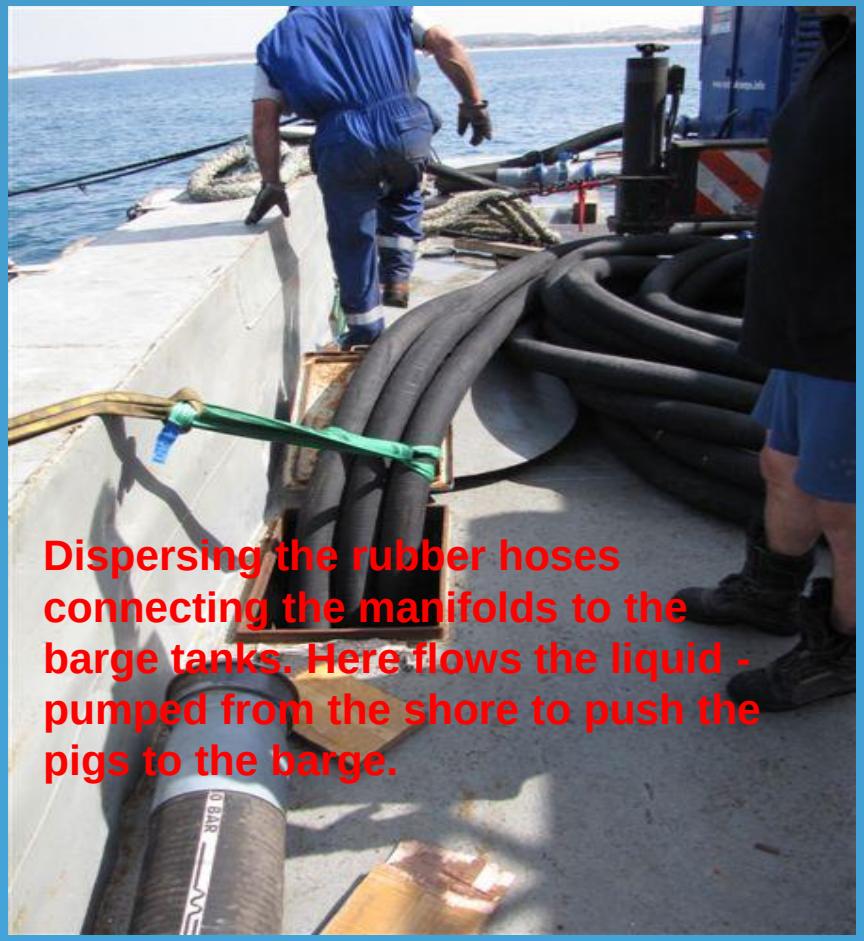
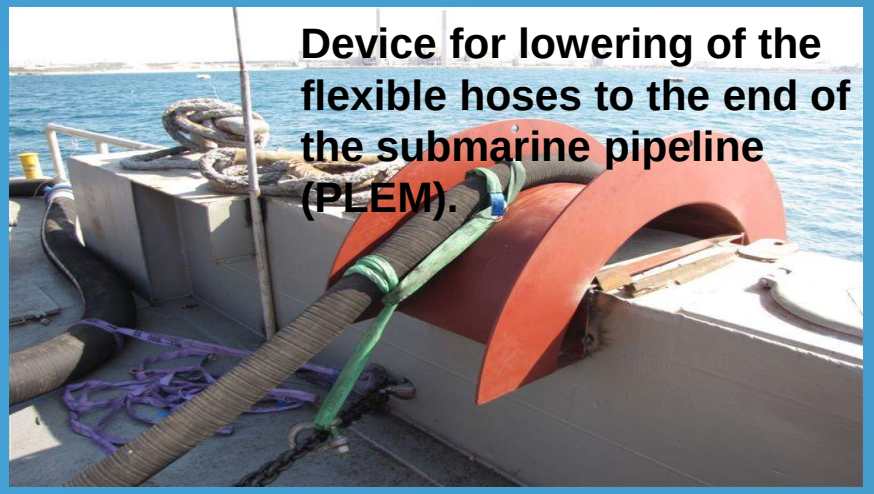


Dispersing the rubber hoses connecting the manifolds to the barge tanks. Here flows the liquid - pumped from the shore to push the pigs to the barge.

Connections at the diesel pump of the manifold hoses



Device for lowering of the flexible hoses to the end of the submarine pipeline (PLEM).

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Arranging the equipment opposite the Eskhol Power Station in Ashdod

Manifold system incorporating a diesel pump


Dispersing the manifold hoses between the barge tanks.

- Stationing of the barge with the equipment above the offshore end of the 16" pipeline.
- Assembling the liquid circulation by means of the manifold.
- Connecting between the manifold and the diesel pump.
- Assembling the rubber hoses to the barge tanks.
- Lowering the flexible hoses into the sea, in order to connect them to the pipeline.

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The PIGGING operation in the 16” pipeline

Preparation of the pig launcher.

Assembling of the pig launcher.

Preparation of the pig launching.

Pig for cleaning the pipeline.

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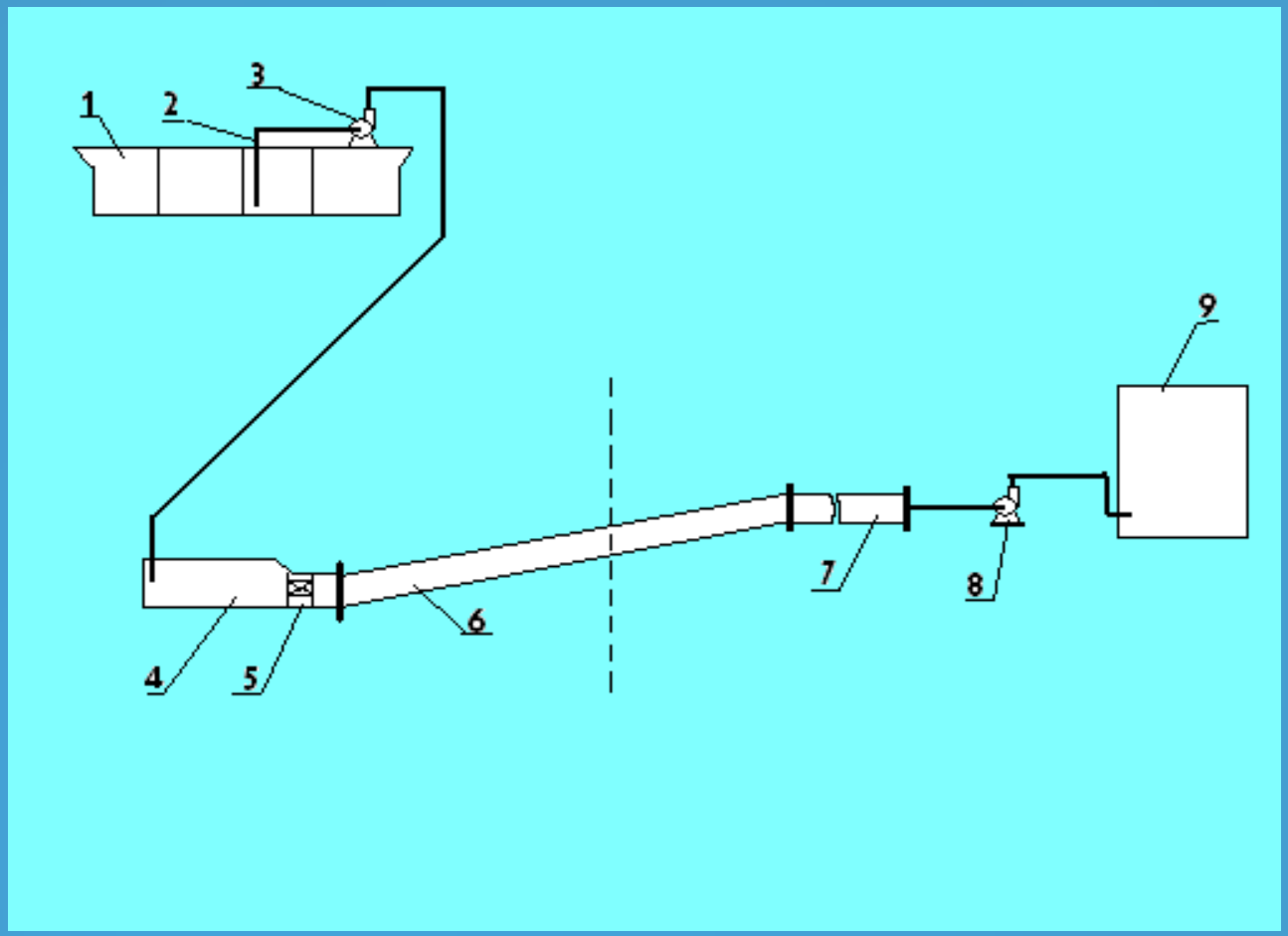
Principle schema for the performance of the 16”&24” pipeline inspection



Offshore side

1. Barge
2. Manifold
3. Diesel pump
4. Sub marine pig launcher
5. Pig
6. Submarine fuel pipeline

Onshore side

7. Overland pipeline
8. Circulation system in the power station including pumps, valves, hoses and taps.
9. 4,000 Cum fuel tank , filled with water for the project.

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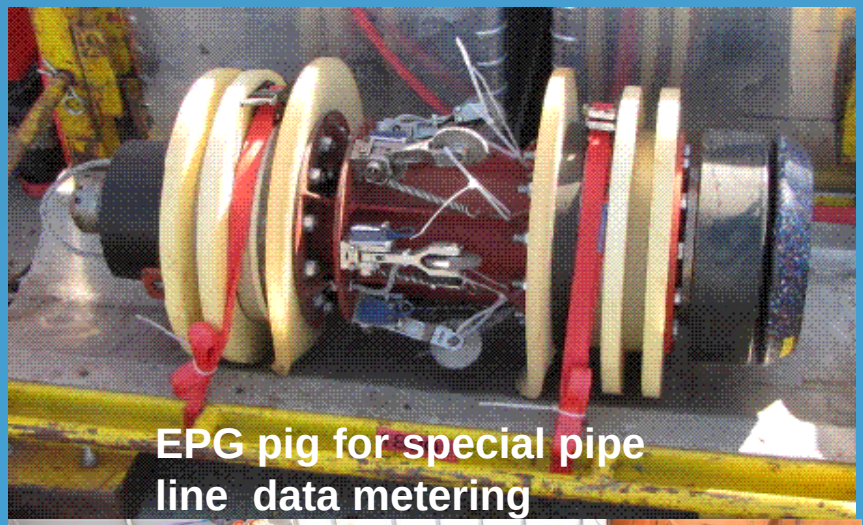
Pigging operation in the 16” pipeline.



EPG pig for special pipe line data metering

Devices for metering the pressure inside the pipeline

Applying the manifold

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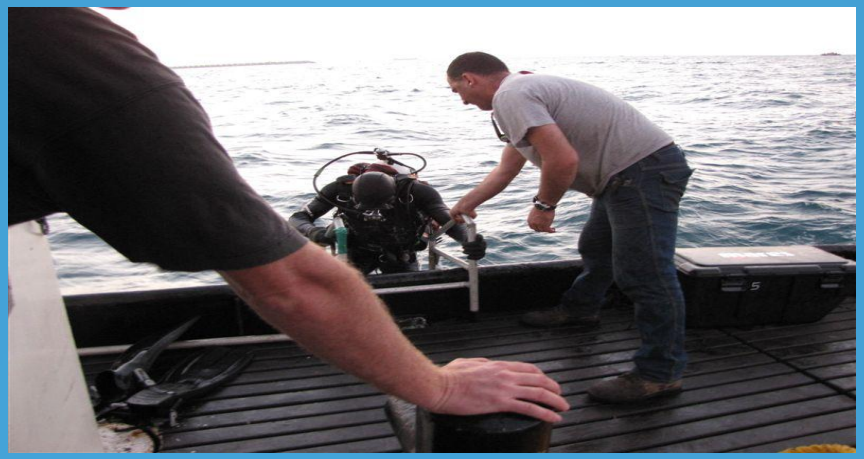
Pigging operation in the 16" pipeline.

- **The launching program for the inspection of the 16" fuel pipeline:**

1. **Gauging pig to check the free passage, ["pioneer"]**
2. **EPG pig for testing the bends / radius parameters inside the line.**
3. **Cleaning pig,**
4. **Magnetic pig for cleaning the debris.**
5. **Intelligent pig ["the crown diamond"], a High -Tech MFL inspection pig [Magnetic Flux Leakage System]**



- **The actual performance of the 16" line pigging was as follows:**

1. **Launching the gauging pig from the offshore PLEM to the onshore edge; the pig got stuck inside the line, and didn't reach the shore.**
2. **Search for location of the gauging pig by means of divers with acoustic detector.**

Looking for the location of the stuck pig.

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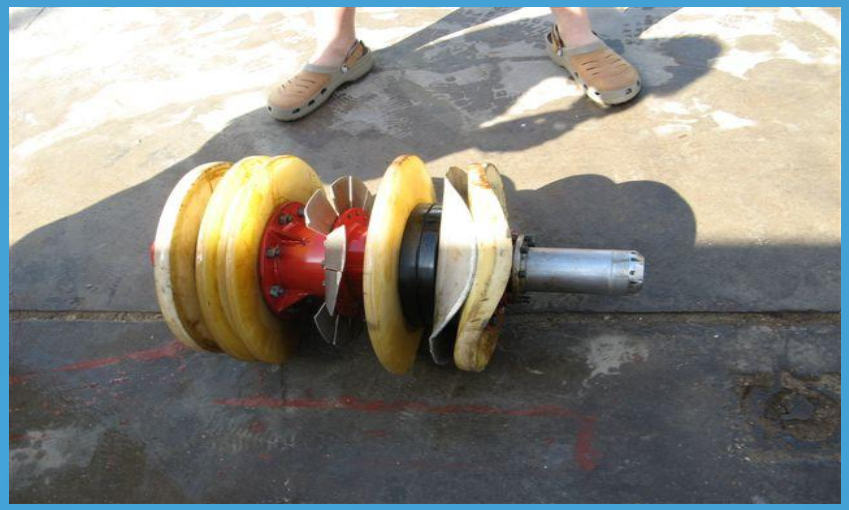
Performance of the pigging in the 16" pipeline.

Looking after the pig with acoustic detector.



The gauging pig after the transmitting

3. Detection of the pig 400 meter from the water line; the pig got stuck due to a deep dent in the line.
4. The mission to release the pig, by raising the pressure inside the line.

   The IEC pump service team raised the pressure at the shore side and succeeded to pump the pig back to the offshore end.
5. Dismantling the blind flange of the pig launcher to extract the gauging pig .

   The gauging pig is a light-weight and relatively low-cost tool, which is easily released. Its task is to check the pipe passage area prior to the transmitting of the sophisticated high cost pigs.
6. From the damage inflicted upon the gauging pig, the PNS & Rosen experts concluded that the obstruction in the line is at least 30% and can not be passed . The section is un-piggable.

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Pigging operation in the 24” pipeline.

Gauging pig inside the pig launcher

Pig launcher

Assembling the pig launcher

Assembling the pig launcher

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Pigging operation in the 24” pipeline.

The gauging pig after completing its run

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Preparing diving equipment and dropping the divers off for their underwater work.

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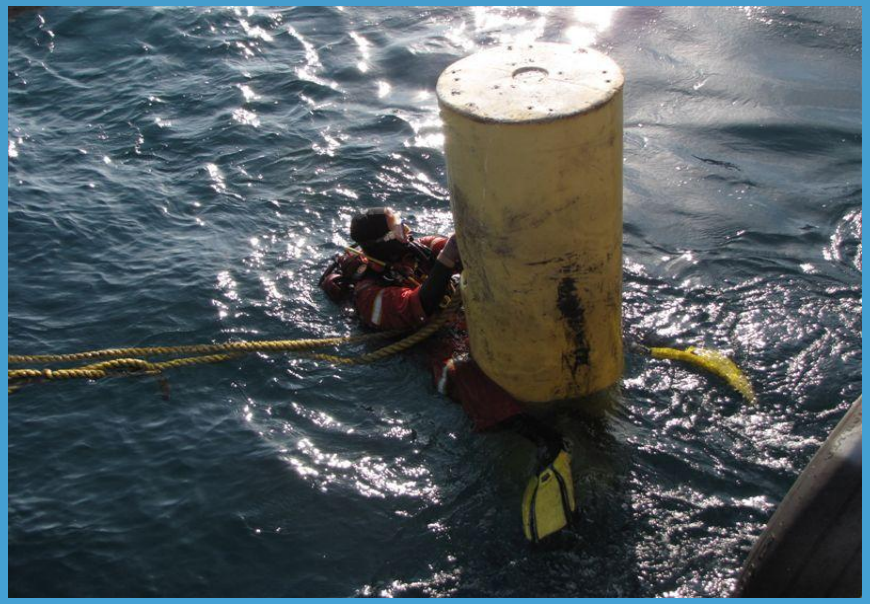
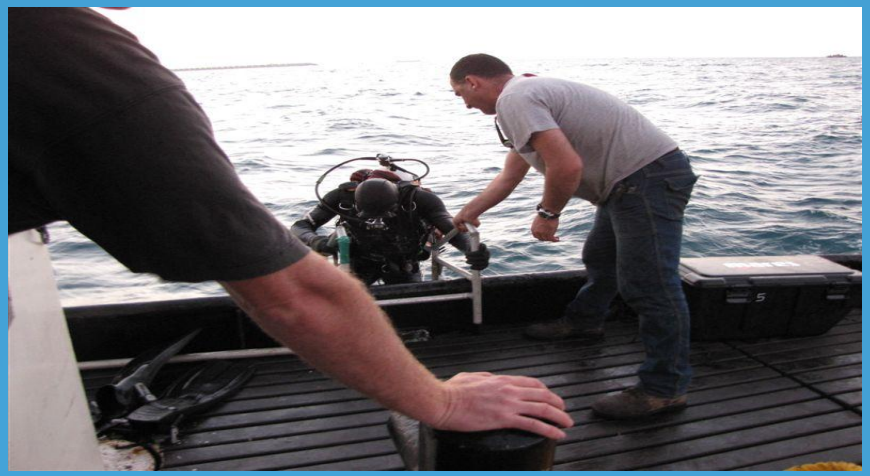
Diving Operation





- Preparation of the diving equipment.
- Accompanying of the equipment underwater.
- Assembling of the launcher to the fuel line at 25 meter depth under water.
- Connecting the launcher to the manifold by means of the flexible hoses.

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Diving activities

- No-leakage test by the divers of the complete –underwater- system, with the operation of the pumps.
- Discovering the location of the pig by means of an acoustic detector.
- Dismantling of the system upon completion of the inspection.

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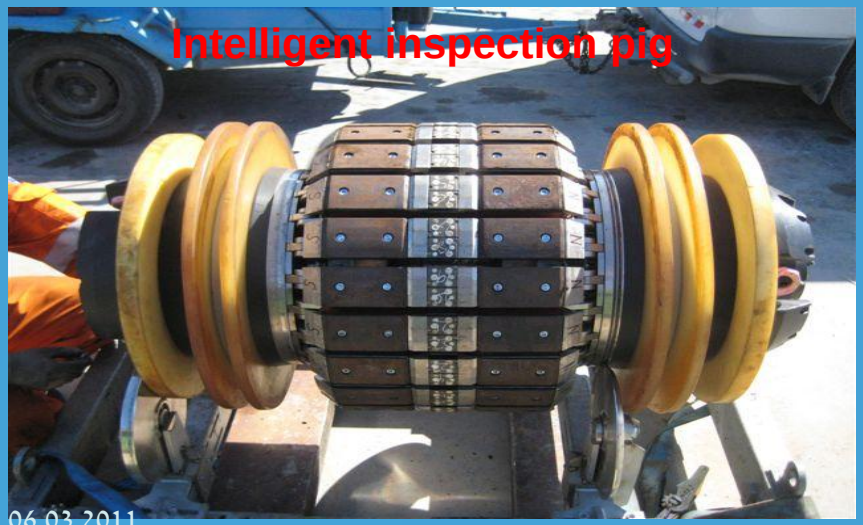
Pigging Operation in the 24” pipeline



- Operating the pump.
- Adjusting manifold correctly
- Non leakage / soundness tests of the system.
- Primary inspection of the line by the “gauging pig” [“the pioneer”], a relatively cheap and especially light-weight pig , destined to check the free passage in the line, in order to eliminate failures at subsequent launchings of the cleaning and intelligent pigs.

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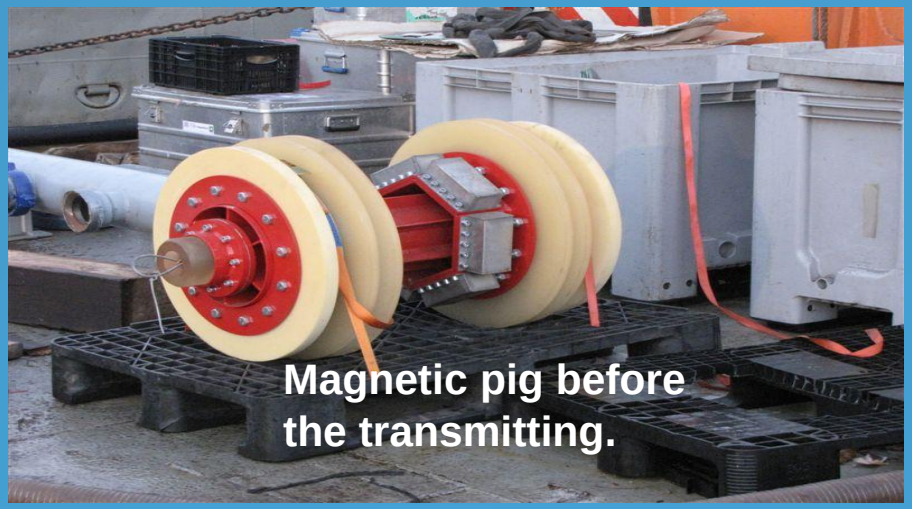
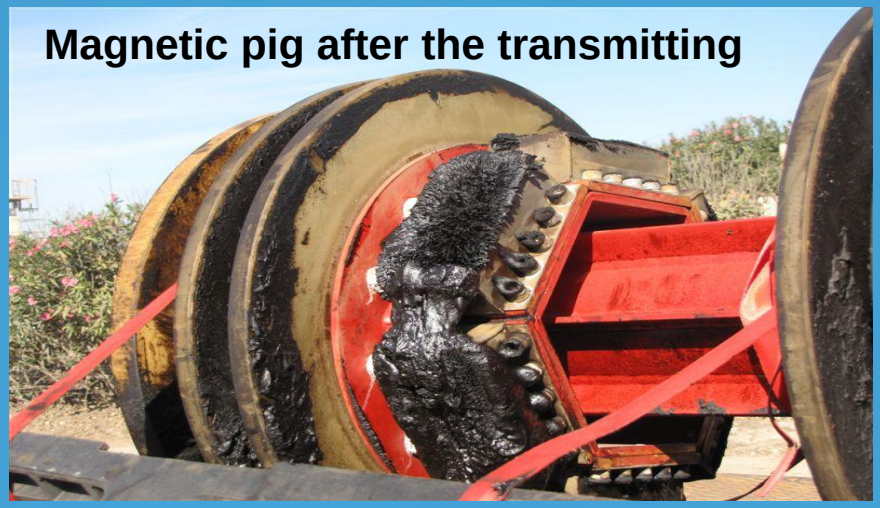
Pigging Operation in the 24" pipeline



Magnetic pig before the transmitting.



Magnetic pig after the transmitting

- Internal cleaning of the fuel line by the brush pig,
- Collection of metallic debris by the magnetic pig,
- Performance of the inspection by the intelligent pig.
- Conclusion of the pipeline inspection, data checking, submittal of preliminary and sophisticated final report which contains a computerized data base specifying all data of the line: wall thickness, corrosion, bends etc., as a function of distance from launcher.
- Nov. 14th , The finishing date of the Ashdod pipelines, a month after the start of the project, in an exact accordance with the time table.
- A two weeks break in accordance with the time table, and then the continuation with the Hadera pipeline inspection

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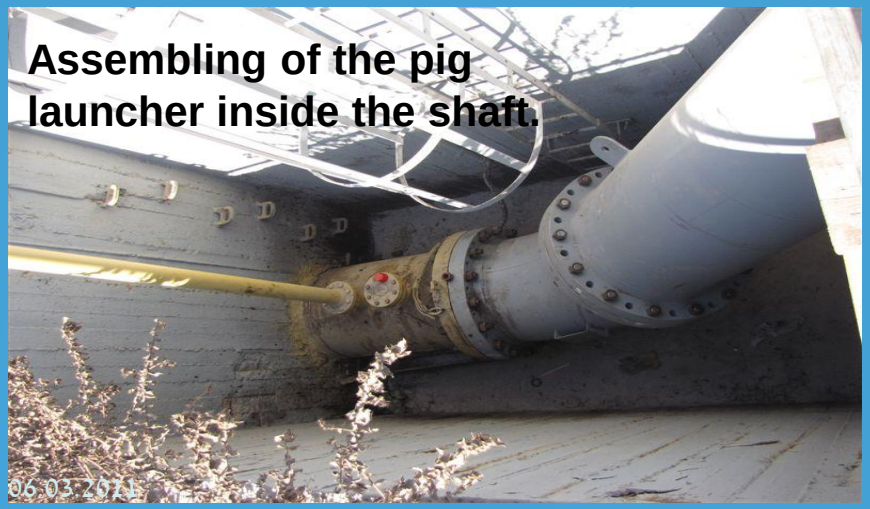
Pigging Operation in the 32” pipeline



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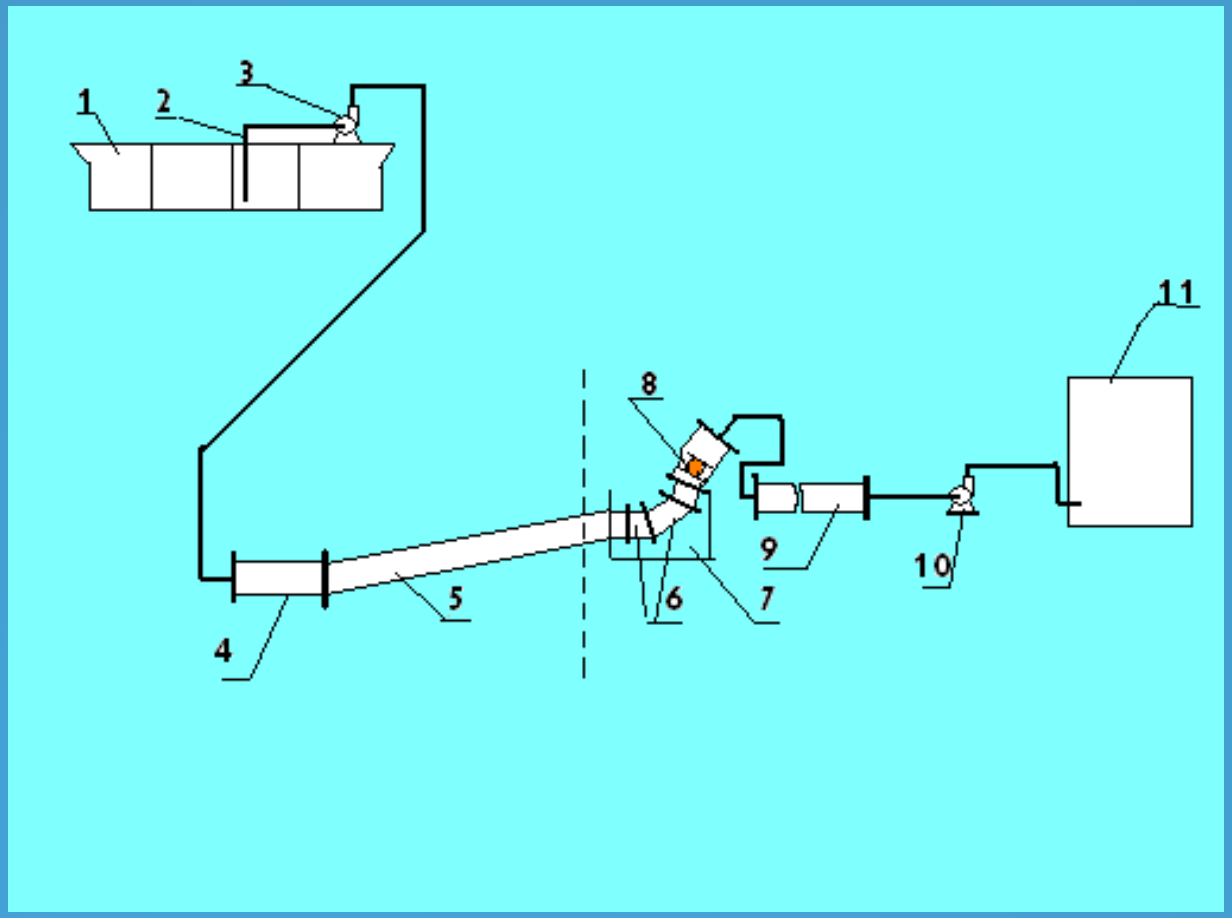
Principle schema for the performance of the 32" pipeline inspection



Offshore side

1. Barge
2. Manifold
3. Diesel pump
4. Submarine pig launcher
5. Submarine fuel line.

Onshore side

6. Pig launcher inside the shaft
7. Concrete shaft.
8. Pig
9. Overland line to the power station.
10. Liquid Circulation system at Power Station including pumps, valves, etc.
11. 10,000 Cum. fuel tank , [filled with water for the project]

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Pigging Operation in the 32” pipeline


Connecting of the flanges


Pig launcher top view


Preparations on the barge


Preparations on the barge

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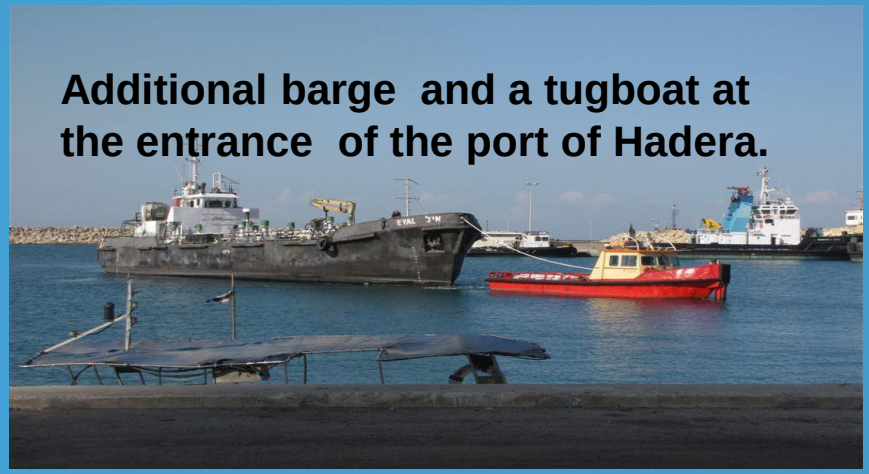
Pigging Operation in the 32” pipeline

Stationing the barge above the offshore end of the 32” pipe line.

Lowering the launcher with the crane from the barge into the sea

Lowering the launcher to the sea.

Additional barge and a tugboat at the entrance of the port of Hadera.



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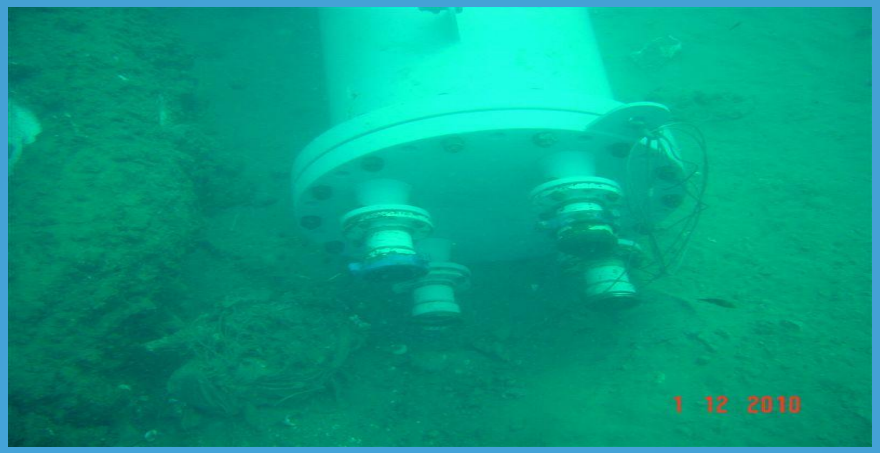
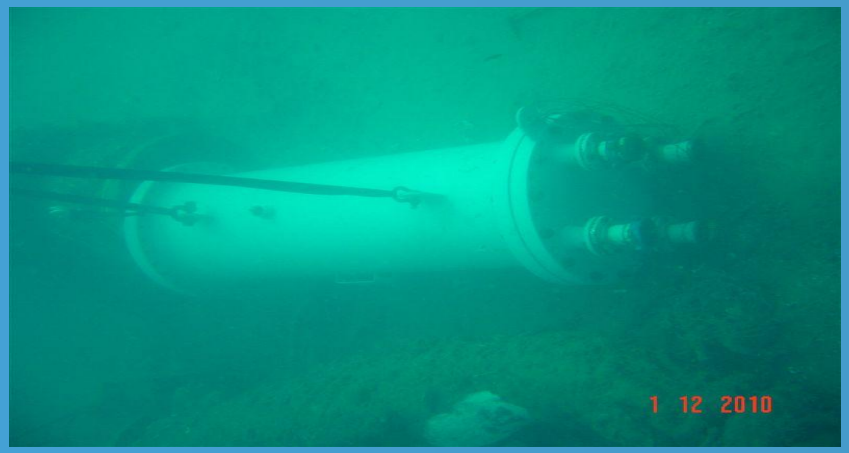
Diving activities





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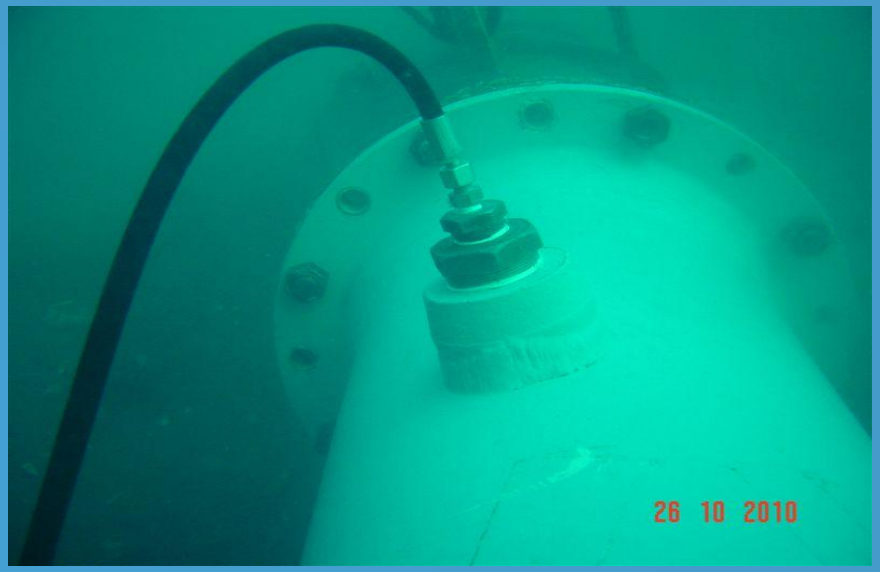
Diving activities



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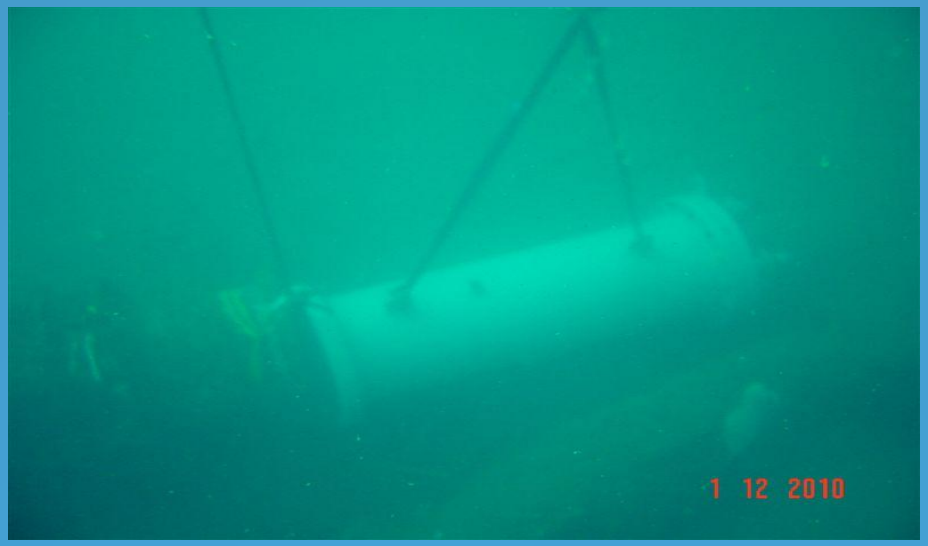
Diving activities



- Preparation of the diving equipment.
- Under water accompanying of the equipment
- Under water assemblage of the launcher to the fuel line at 25 meter depth.
- Connecting the launcher to the manifold with flexible hoses.
- Non leakage test of the submarine system, with the operation of the pumps
- Detecting the location of the pig by means of an acoustic detector.
- Dismantling of the system upon completion of the inspection.

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Pigging Operation in the 32” pipeline

Cleaning (brush) pig for 32” line

Magnetic pig for 32” line.

Work progress:

- Dismantling parts of the pipe line in the shaft in order to assemble the onshore launcher
- Assembling of the onshore pig launcher
- Stationing the barge at the offshore pipe line end, opposite the power station.
- Assembling the offshore pig launcher to the pipe line
- Connecting the offshore launcher to the manifold with flexible hoses.

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Pigging Operation in the 32" pipeline

Dismantling the gauging pig from the launcher.

Checking the damages inflicted upon the pig .

- Assembling of the offshore system: the submarine launcher, manifold and pump on the barge, and connections amongst them.
- Performance of the pigging: launching of gauging pig from onshore launcher and reversing direction at offshore launcher.
- The pig came out significantly damaged and bent.
- The inspection will be continued only after gathering information regarding the essence of the obstructions inside the pipe line.
- In this line the method of sending a gauging pig before the intelligent pig proved itself! It prevented the smart pig getting stuck [saving the cost of it of approximately 1 million Euro].
- December 17th 2010, the termination of the project, a duration of two months [in exact accordance with the time table].

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The project partners

- The customer: Israel Electric Company – Eng. Rami Menashe, Rubi Kobo, Eng. Simcha Darmuni, Eng. G'oma, Eng. Shraga Veitzman , Eng. Shay Wasserman,
- Dutch contractors : PNS, Rosen; Project Manager: Mr. Harrald Groeniger,
- Marine contractor: Gal Yam, Mr. Ilan Nixon, Sapir, Ron Ginsburg.
- Coordination / administrative management: D.I.F. , Eng. Gideon Groen, Eng. Vladimir Donskoy, Eng. Ilan Feder.

- This presentation has been prepared by D.I.F Engineering Ltd.