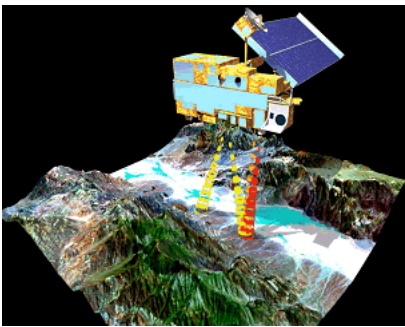


Routing and Survey (Onshore)

The engineering of oil and gas transportation systems in desert, remote or rugged regions pose particular challenges for data collection. J P Kenny are experienced in the use of specialised geospatial technologies combined with GIS and satellite and aerial imagery to maximise the early and efficient collection of this data and maximise the cost benefit to our Clients during the initial phases of project and throughout the life of the development:



CHALLENGES

- Inaccessible and Remote Terrain
- Limited availability of detailed cartographic mapping data
- Restricted access due to security restrictions
- Transportation and Equipment Logistics
- Availability and cross referencing of project data
- Demands of fast-track project timescales

SOLUTIONS

Geospatial Technology

- Integration of all data within a centrally accessible map-based project data repository.
- Early mapping and route engineering using satellite and aerial imagery.
- Focused field work using GIS, GPS, electronic data logging and telecommunications.
- Analysis, interpretation, visualisation and modelling using GIS and image processing techniques.
- Facilitates fast collective decision-making.
- Through-life map-based information system to support pipeline Asset Integrity Management.
- Early accuracy is increased.
- Benefits for project quality and safety.
- Through-life information resource

CAPABILITY

Map Based Repository of Project Data

From the very beginning of a pipeline project all georeferenced data sets (are brought together within a central map-based data repository. Any uncertainty or inconsistency about the location of features becomes immediately apparent.

Early Mapping

During the early phases of a pipeline project satellite imagery can be procured quickly and at reasonable cost. This is particularly important for remote areas where other sources of up-to-date mapping may not exist.

Interpretation of Near Surface Geology

Skilled interpretation of satellite imagery can provide information on near-surface geology. Early information on issues such as ground hardness (rock vs soil) and wetness enables routing decisions to be made that result in significant project cost savings.

Fault Mapping

The angle of pipeline crossing across active seismic faults is important, to reduce the impact of any later movement. Satellite imagery can be used to locate and analyse seismic faults. The early identification of seismic faults is crucial to establishing a cost-effective route, and minimising potentially costly pipeline re-routing at a later stage.

Detection of Ground Movement

Advanced interpretation techniques are now available that can detect very small (centimetre) relative changes in elevation of adjacent areas of ground, and areas of ground where the surface texture has changed. This interpretation can yield important information on potential hazards to pipelines due to land movement and seismic activity.

Elevation Modelling

Using the latest Software, Digital terrain models can be overlaid with high resolution imagery to produce a true 3D visual aid for routing of pipelines across rugged or remote terrain. Profiles can be generated on-the-fly from the processed DEM for the purpose of hydraulic calculations and siting of pumping stations, etc.

Route Selection and Optimisation

Advanced automated route finding and optimisation techniques are now available that take into consideration the relative cost and difficulty of traversing different types of terrain types and obstacles.

Route Cost Estimation

With knowledge of the key 'cost drivers' it is possible for the engineer to estimate the cost of various pipeline route options. The process is fast, and the costing process is documented and auditable.

Field Layout and Economics

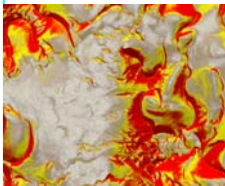
Using JPK In-house program "FOCUS" running within a GIS environment, J P Keny can produce export lists of cost components (with lengths, sizes and cost attributes), analyse the development and investment cost, based upon a project Unit/Vendor Cost database.

Asset Integrity Management

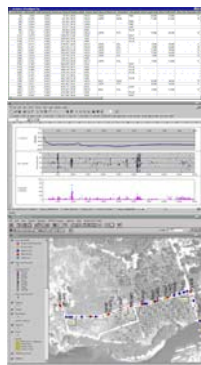
GIS is used as a repository for all the data pertaining to the pipeline including drawings, registers, NDT/weld defects, crossing details, inspection records, operating instructions and land acquisition records. All the above data can be visualised within the GIS along with mapping, design and infrastructure data.



Satellite Imagery allows mapping to be generated rapidly in remote or areas of restricted access.



Elevation modelling allows - side slope, - slope, and - elevation

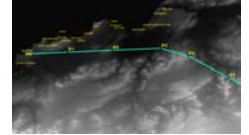


Pipeline Asset Integrity Management Visualise the mass of inspection data generated during the operational life from the three key perspectives - Mapped, Tabulated and Profiled

EXPERIENCE

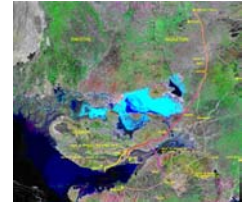
BP – Gas Export Study Algeria

A desktop study for the export of gas from Block 231 and 232 was undertaken to assess potential route options and lengths in a GIS. SRTM data was processed to produce a slope and contour data set and used to extrapolate elevation for the steady state hydraulic analysis.



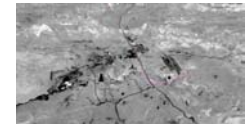
Cairn Energy - Mangala Field Export Pipeline Study

A desktop routing study was undertaken prior to the field reconnaissance trip. This included environmental constraints map produced in a GIS environment along with various engineering constraints. Landsat 7 and Quickbird High Resolution Imagery was used to define four possible routes.



Khalda Petroleum Company - Qasr Gas Development Project

Provision of all facilities and pipelines required to develop the Qasr gas/Condensate Field and link it to two existing treatment plants both 100km from the field. Involvement from FEED, through detailed design to Construction Management.



Petrodar – Melut Basin Pipeline Project

FEED, Conceptual design and Basic Engineering for the complete export pipeline, pump station heater station and marine terminal. Use of GIS in the field using GPS based field routing to expedite route development.



SI-Tech International – Egypt to Turkey pipeline

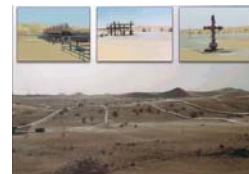
Conceptual Engineering and routing carried out for a 400km in length, starting from an existing landfill near Aqaba and terminating at the Jordan/Syria border.

The line originates from Egypt and crosses the Gulf of Aqaba into Jordan. After a metering station, the line feeds Aqaba Power Station and Fertiliser Plant before a new Compressor Station at Aqaba.



BHP/AGIP/Sonatrach – ROD Field Development

Conceptual and FEED study for all offsite facilities between the wellhead and the Central Processing Facility for twin trunklines.



BHP/Petrofac - OHANET

Preliminary route assessment through mountainous terrain using satellite imagery. Country route corridor survey for 150km of trunkline and flowlines in Algeria.



J P KENNY

ABERDEEN
+44 1224 347300

HOUSTON
+1 281 675 1000

LONDON
+44 1784 417200

MELBOURNE
+613 9211 6400

NEW DELHI
+91 11 2642 7700

JAKARTA
+62 21 8370 2455

KUALA LUMPUR
+60 3 2162 1266

PERTH
+61 8 9 4818222

NORWAY
+47 5195 1821

www.jpkenney.com

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