



Data and Analytics

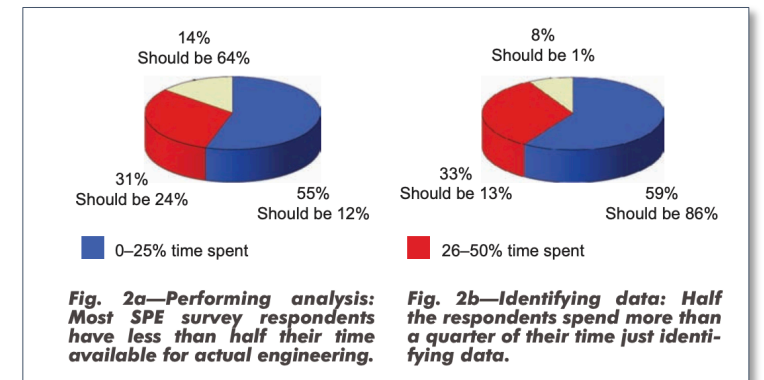
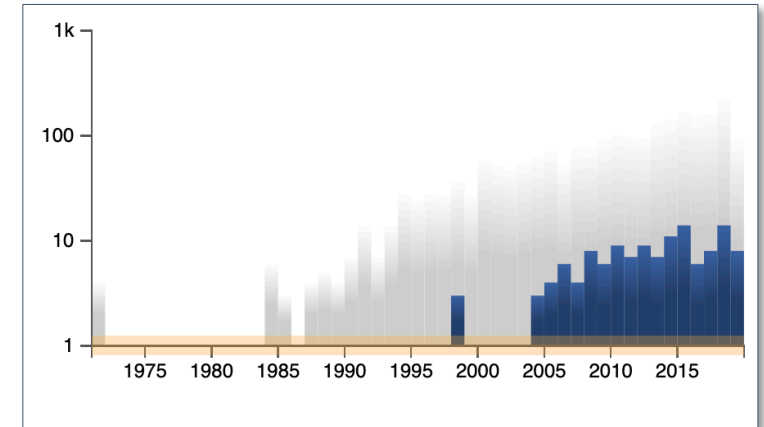
Unconventional Session in Progress

Knowledge Discovery in DELFI

Our mission is to create value from unstructured data
with Artificial Intelligence

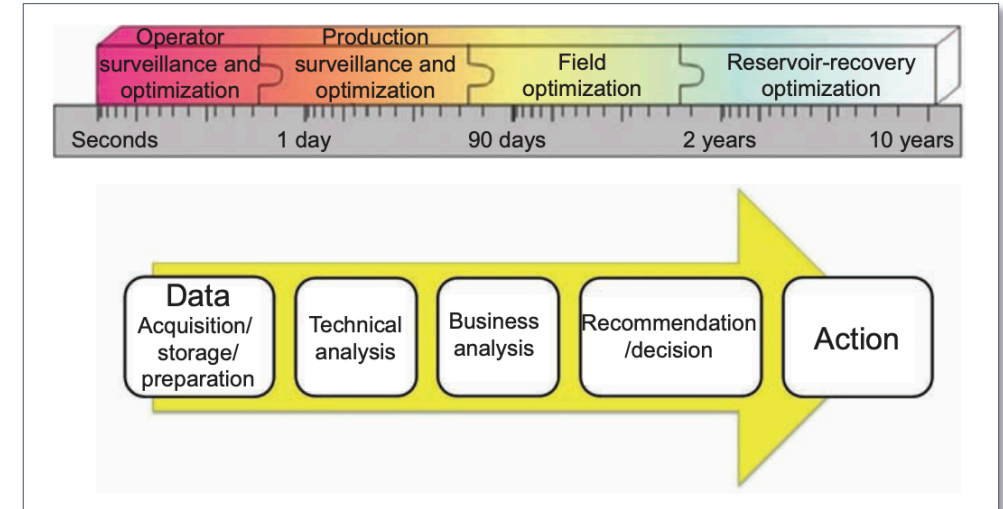
Background

- Data processing and analytics have matured in the last 40 years
- Concern about *data reuse* is more recent:
 - “½ of respondents spend > ¼ time identifying data”
- *Information reuse in text* remains a challenge

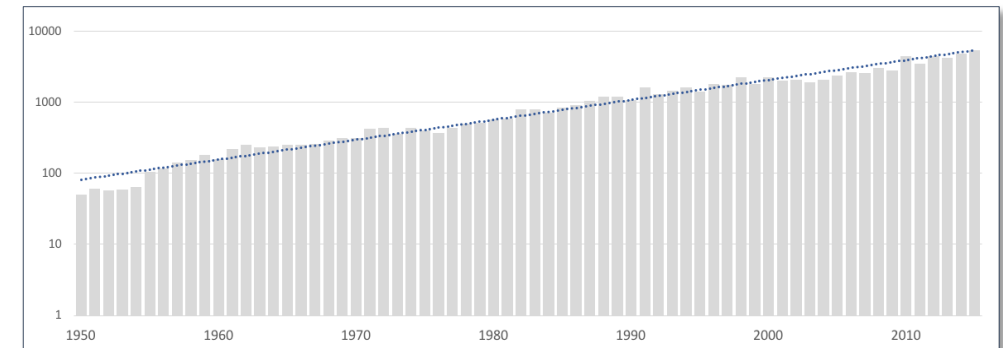


Why is Text Important?

- Data drives real-time control...
- ... but written reports drive tactics and strategy.
- Reports are valuable, but rapidly get lost in content clutter.
- Content doubles about every 10 years.



SPE-0909-0048-JPT, Sept. 2009



SPE-191758, Sept. 2018

What Kind of Text?

- Interpretations
- Text included with structured data
 - Remarks in daily activity logs (daily drilling reports, production reports, etc.)
- Policies, procedures, and manuals
 - Written to be directly actionable by people, not computers
- Written material that may have a long “shelf life”
 - Insights that are valuable long after being written
- Written material may only be useful for a short period
 - Email, internal and external web pages (e.g., news)

Text Analysis Goals: Find Structure in Documents

i2k Connect

Title	What is the best name for this text? Especially important when analyzing file shares!
Summary	What is a short, useful synopsis?
Key phrases	What concepts stand out?
Classification	What is it about, relative to one or more taxonomies?
Named entities	What does it mention: Places, oil fields, basins, formations?
Data points	What labelled values (or tables of values) can be extracted?

- Large vocabularies: high dimensionality problem space
 - Techniques that reduce dimensionality can lose accuracy
- Multiple languages
- Lack of good, complete labelled training examples
- Words have multiple meanings: homonymy and polysemy (e.g., metaphor)
 - Phrases are more precise than words but have variable length
 - Idioms: “hot potato” is not a reference to food...
- Visual layout—alignment, font size—implies a “hidden” meaning
- Noise (e.g., misspellings), formats, size, OCR, ...
- All the usual system issues: performance, scalability, reliability, security, ..., memory pressure

- Good text analysis is like a good assistant
 - Reduce the manual effort to use information in documents
- Improved search efficiency: recall and precision
 - Find by classification
 - Drill down to a desired result... much like how you buy things on the web
- Improved usability
 - Titles and summaries help users to decide which documents to explore
 - Key phrases can lead to discovery
 - Leverage structure from text analysis to find other information:
 - *e.g.*, place names => places on a map
 - In general, use all the power of mature structured data analysis tools!

i2k Connect in DELFI

i2k Connect

DELFI Portal

DELFI | Data Ecosystem Admin

DELFI Petrotechnical Suite

DELFI Developer Portal | Sign In

+

← → ↻ Schlumberger N.V. [US] | eur.data.delfi.slb.com/visualize/view=card

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DELFI | Data Ecosystem Admin

?

Schlumberger HQ-EUR-DEMO (Account)
SystemDefault (Data Partition) RK

Dashboard

Ingestion Admin

Data Curation Monitoring

View Data

Legal Tags

Entitlements

Data Catalog

Developer Portal

View Data

211/19-M15/04 (text) ✕ seismic processing (text) ✕

⌕ ⌕ ⌕ ⌕

211_19-M15_REP_GPHYS_VSP_252
507905.PDF

✕

🔍

INFORMATION

Size : 9.04 MB

CLASSIFICATION

Reservoir Description and Dynamics >
Reservoir Characterization > Seismic
processing and interpretation

DOCUMENT FACTS

Tables (9) Show

Forms (3) Hide

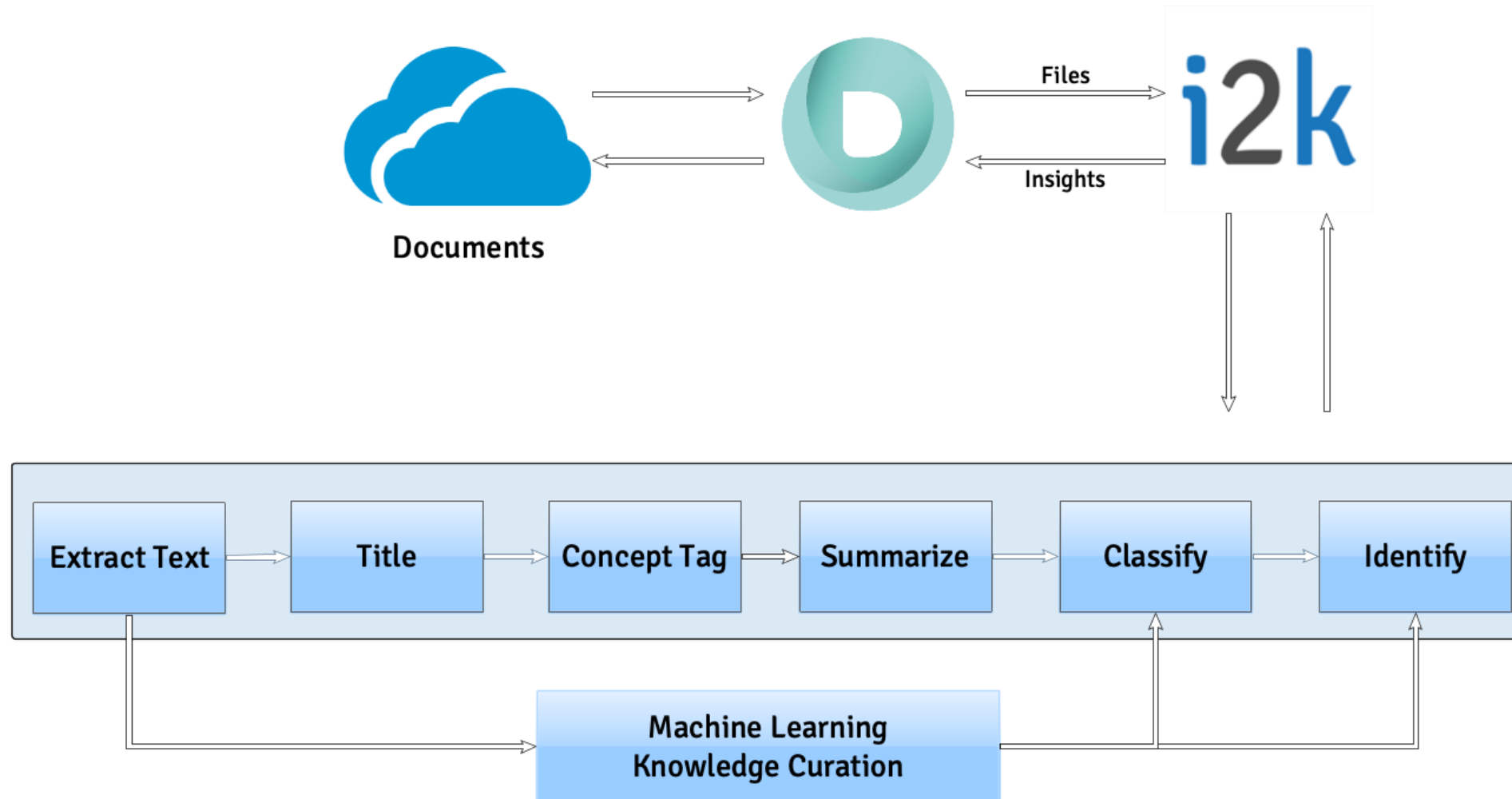
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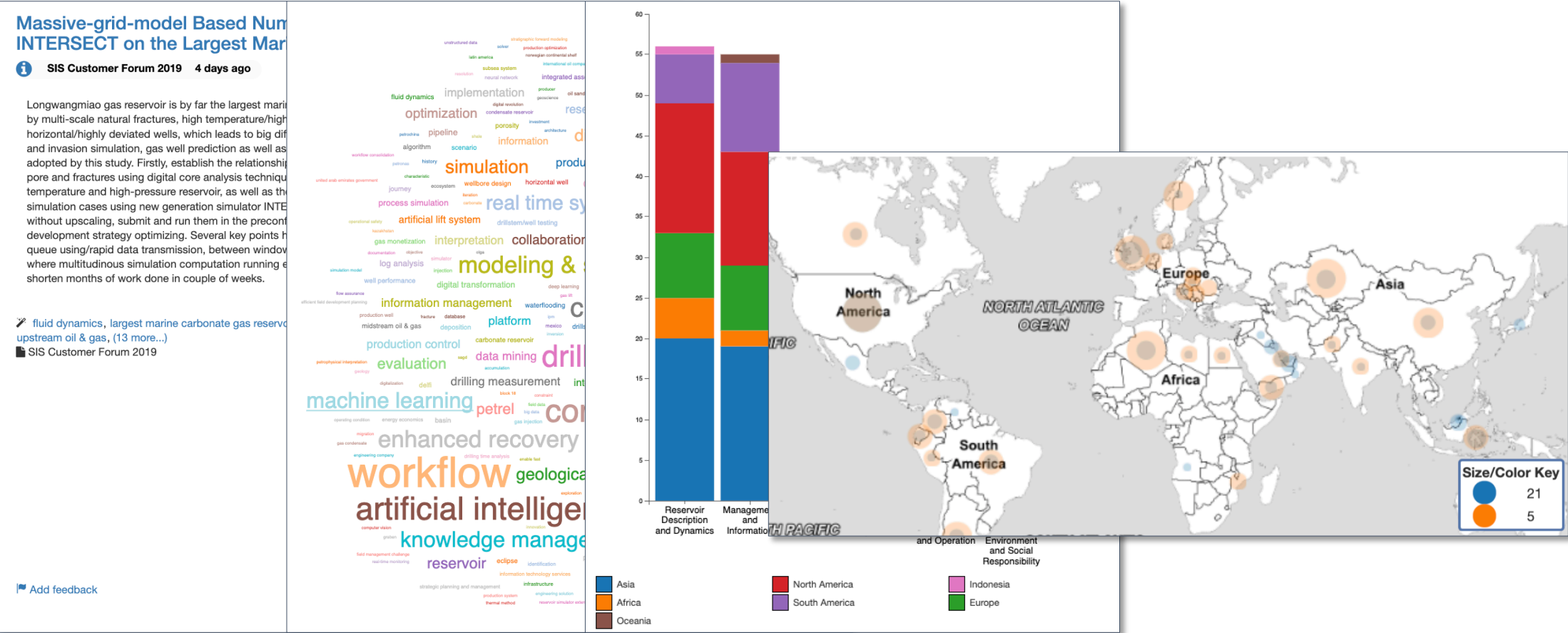
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WELL CHECKSHOT COMPUTATIONS

COMPANY :- Conoco (UK) Limited
WELL :- 211/19-M15/04

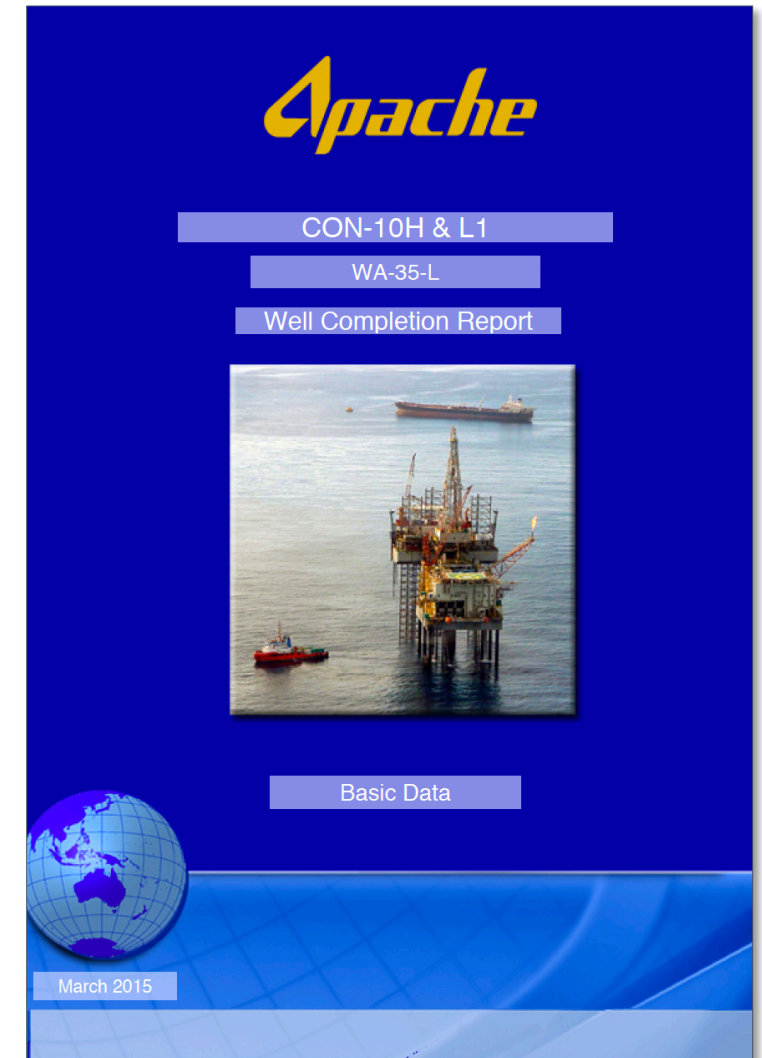
ELEVATION OF REFERENCE LEVEL (AMSL) 184.0 FEET
ELEVATION OF DATUM (AMSL) 0.0 FEET
DEPTH OF SOURCE BELOW SURFACE 30.0 FEET
SOURCE TO MONITOR OFFSET 5.0 FEET
ELEVATION OF SURFACE AT SOURCE (AMSL) .. 0.0 FEET
ELEVATION OF SURFACE AT WELL HEAD (AMSL) 0.0 FEET
DEPTH OF SEA-BED BELOW SURFACE 5120 FEET
WATER VELOCITY 4850 FEET/VS
SOURCE OFFSET FROM WELL HEAD .. DISTANCE See FEET
BEARING. below DEGREES





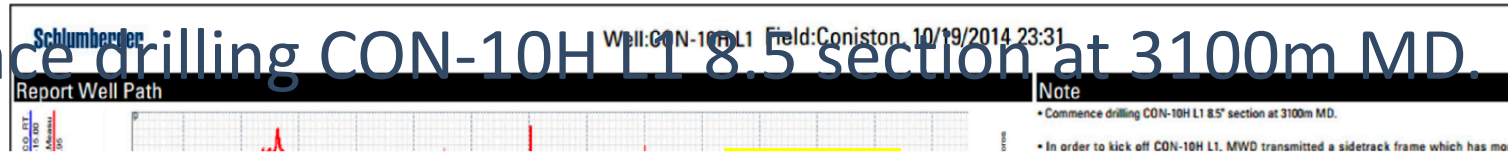
Analyzing Large Documents

- Example:
 - Carnarvon Basin End-of-Well report
 - 2175 pages
 - Tables, daily drilling, daily geology, logs, etc.
 - <https://nopims.dmp.wa.gov.au/Nopims/Search/Wells>
- What can we discover?
 - Identify what it is
 - Identify what is in it—section by section
 - Extract data from sections
 - Look at inter-section trends
 - Look for interesting content in individual sections

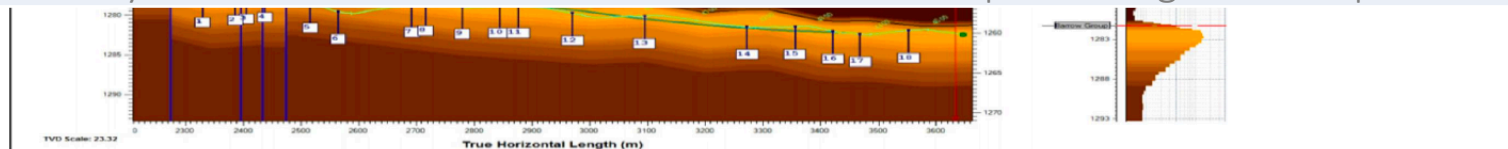


Large Documents: Classification

- Commence drilling CON-10H L1 8.5' section at 3100m MD.



Topic	Score
Well Drilling	1
Well Drilling > Drilling Measurement, Data Acquisition and Automation	0.96
Well Drilling > Drilling Operations	0.75
Well Drilling > Drilling Operations > Geosteering / reservoir navigation	0.53
Well Drilling > Drilling Measurement, Data Acquisition and Automation > Logging while drilling	0.52
Reservoir Description and Dynamics	0.3
Reservoir Description and Dynamics > Formation Evaluation & Management	0.16
Well Drilling > Well Planning > Trajectory design	0
Well Drilling > Wellbore Positioning	0
Well Drilling > Drill Bits > Bit design	0
Well Drilling > Drilling Measurement, Data Acquisition and Automation > Measurement while drilling	0
Reservoir Description and Dynamics > Reservoir Characterization > Seismic processing and interpretation	0



Large Documents: i2k Oilfield Places™

Company:
Field: Coni
Well: CON-
Rig Name:
Country: A

- Oceania
North V
Block W

Schlumberger

Company:

Apache Energy Ltd

Field:

Coniston

Well:

CON-10H L1

Rig Name:

Atwood Falcon

Country:

Australia

Report Date:

Sunday, 19 October 2014
(UTC+08:00) Perth

Prepared by:

Laura Pontarelli/Matthew Rigden

Well Placement End of Well Report

Product Code:

Disclaimer

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Three companies. It's a JV. Shell is the operator.

Operator Shell, ConocoPhillips, and Petronas Carigali

made a significant discovery with the Ubah-2

exploration well, located in Deepwater Block G

of more northwest Sabah, Malaysia. The discovery and

The well is named Ubah-2, and it's an exploration well.

It's the 2nd well with the "Ubah" prefix, so "Ubah" might be a field.

Block appraisal wells were drilled in a depth

Offshore Block G is near the Sabah region of Malaysia.

It's located in Block G, which is an offshore block.

Large Documents: Cutting Edge Data Extraction

i2k Connect

APACHE ENERGY LIMITED

Page 1 of 3

Apache ENERGY LIMITED
Daily Drilling Report

WELLBORE NAME: Con-10H DATE: 15-02-2013

API #: 00 24 HRS PROG: -377.75 (m) TMD: (m) TD TVD: (m) REPT NO: 2

RIG: ATWOOD FALCON FIELD NAME: CONSTON AUTH TMD: 4,223.00 (m) PLANNED DOW: 48.88 (days) DOL: 1.94 (days) DFS: 0.00 (days) WATER DEPTH: 377.75 (m)

WB NO DATE: 19-02-2013 11:30 WELL SPUD DATE: 19-02-2013 11:30 RIG RELEASE: 02-11-2014 16:00 SUPERVISOR 1: DAVID GENTLE / CRAIG MITCHELL / BILL MCLAUGHLIN OIM: DAVE STENZEL PB TMD:

REGION: AUSTRALIA DISTRICT: CARNARVON BASIN STATE / PROV: WESTERN AUSTRALIA RIG PHONE NO: RIG FAX NO:

AFE # 17-12-0108-PD-031

DESCRIPTION: Con-10H (Bi-Lateral) Drill and Complete Stage 1

AFE COSTS: DHC: 35,009,368 DCC: 23,425,183 CWC: Others: TOTAL: 58,434,571

DAILY COSTS: DHC: 770,129 DCC: CWC: Others: TOTAL: 770,129

CUMULATIVE COSTS: DHC: 2,836,989 DCC: CWC: Others: TOTAL: 2,836,989

DEFAULT DATUM / ELEVATION: ACTUAL FALCON RTE / 22.25 (m) LAST SAFETY MEETING (BLOCK): 10/02/2013 DC-SIG# TARGET FORMATION: BARROW BHA HRS OF SERVICE:

LAST SURVEY: MD: 0.00 (m) INC: 0.00° AZM: 0.00° LAST CSG SHOE TEST (EMW): LAST CASING: NEXT CASING: 762.000 mm @ 465.80 m

CURRENT OPERATIONS: Completed burnishing #3 anchor winch brake bands. Allowing brake bands to cool down.

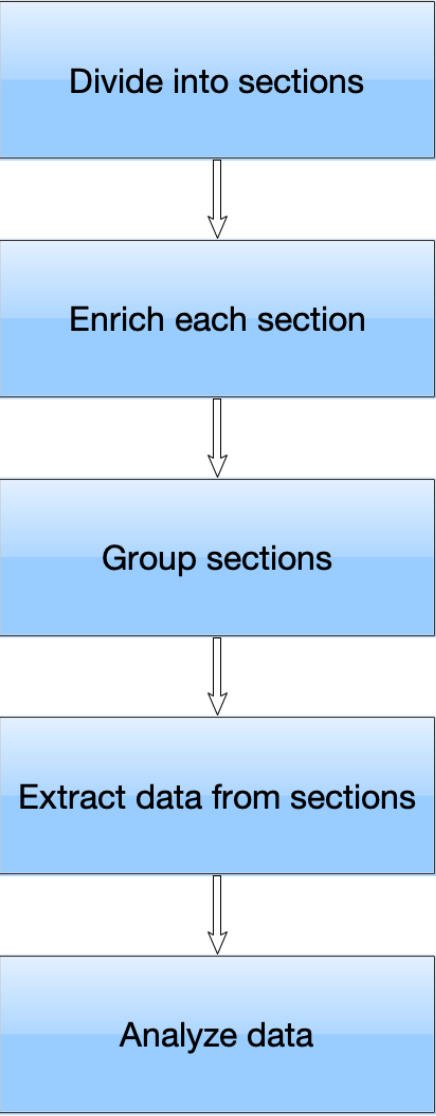
24 HR SUMMARY: Waited on stand-by for MV Skandi Atlantic to arrive to replace Skandi Atlantic on Tow Barge. Changed out vessels. Atwood checked anchor winch brake readings. Attempted to adjust #3 brake to hold 600 amp, was slipping at 150 amp. Burnished brake bands.

24 HR FORECAST: Continue to burnish #3 brake band to hold 600 amps. De-ballast rig to transit draft. Recover anchor #3.

OPERATION SUMMARY

From	To	HRS	Op Phase	Op Code	PT/NPT	NPT CODES	ACTIVITY SUMMARY
0.00	8.30	8.50	R-MOB-DEMOB	RIGREPAIR	CN	MODUA	MV Skandi Atlantic maintained rig on tow barge whilst awaiting on arrival of MV Far Sky.
8.30	10.00	1.50	R-MOB-DEMOB	RIGREPAIR	CN	MODUA	MV Far Sky arrived on location at 09:30 hours. MV Skandi Atlantic shortened up on low bridge wire. Released MV Skandi Atlantic from low bridge and hooked up MV Far Sky to low bridge. MV Far Sky out at 300m on low bridge at minimal power.
10.00	12.00	2.00	R-MOB-DEMOB	RIGREPAIR	CN	MODUA	Atwood Oceanics prepared an MOC based on results of drive through tests on anchor winch windlasses:
							WINDLASS#1 HELD TO 136MT (300KIPS) BEFORE SLIPPING WINDLASS#2 HELD TO 272MT (600KIPS) MAX OF MOTOR OUTPUT WINDLASS#3 HELD TO 68MT (150KIPS) BEFORE SLIPPING WINDLASS#4 HELD TO 79MT (175KIPS) BEFORE SLIPPING WINDLASS#5 HELD TO 272MT (600KIPS) MAX OF MOTOR OUTPUT WINDLASS#6 HELD TO 272MT (600KIPS) MAX OF MOTOR OUTPUT WINDLASS#7 HELD TO 272MT (600KIPS) MAX OF MOTOR OUTPUT WINDLASS#8 HELD TO 272MT (600KIPS) MAX OF MOTOR OUTPUT WINDLASS#9 HELD TO 272MT (600KIPS) MAX OF MOTOR OUTPUT WINDLASS#10 HELD TO 272MT (600KIPS) MAX OF MOTOR OUTPUT WINDLASS#11 HELD TO 272MT (600KIPS) MAX OF MOTOR OUTPUT WINDLASS#12 HELD TO 272MT (600KIPS) MAX OF MOTOR OUTPUT WINDLASS#13 HELD TO 272MT (600KIPS) MAX OF MOTOR OUTPUT WINDLASS#14 HELD TO 272MT (600KIPS) MAX OF MOTOR OUTPUT WINDLASS#15 HELD TO 272MT (600KIPS) MAX OF MOTOR OUTPUT WINDLASS#16 HELD TO 272MT (600KIPS) MAX OF MOTOR OUTPUT WINDLASS#17 HELD TO 272MT (600KIPS) MAX OF MOTOR OUTPUT WINDLASS#18 HELD TO 272MT (600KIPS) MAX OF MOTOR OUTPUT 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12.00	20.30	8.50	R-MOB-DEMOB	ANCHOR	CP		Atwood presented case that root cause of incident was down to brakes. Commenced work on brake adjustments on anchor winch windlasses #3 & #4.
							MV Far Strait change out to 76mm to gypies.
							Obtained all relevant signatures to proceed with Phase I - Deployment of remaining primary anchors.
							#7 anchor passed to MV Skandi Atlantic and commenced setting up fore-runner to receive chain. MV Skandi Atlantic portside ready to receive chain. #7 anchor chain passed to MV Skandi Atlantic. At 14:30 hours MV Skandi Atlantic commenced attaching chain to fore-runner. At 14:45 hours #7 chain connected and waited on confirmation to run anchor. Received confirmation to run #7 anchor at 15:50 hours. Ran out anchor chain to cross-over point. Paid out 1,315meters (4,314ft) of chain. Cross over completed at 17:49 hours. MV Skandi Atlantic ran and set #7 anchor. Chased back PCC and secured same at 20:24 hours. Total wire and chain run out: 1,855meters (6,086ft).
20.30	0.00	3.50	R-MOB-DEMOB	RIGREPAIR	CN	MODUA	Commenced work on brake adjustments on anchor winch windlasses #3. Unable to

Printed: 09/02/2015 9:44:51PM



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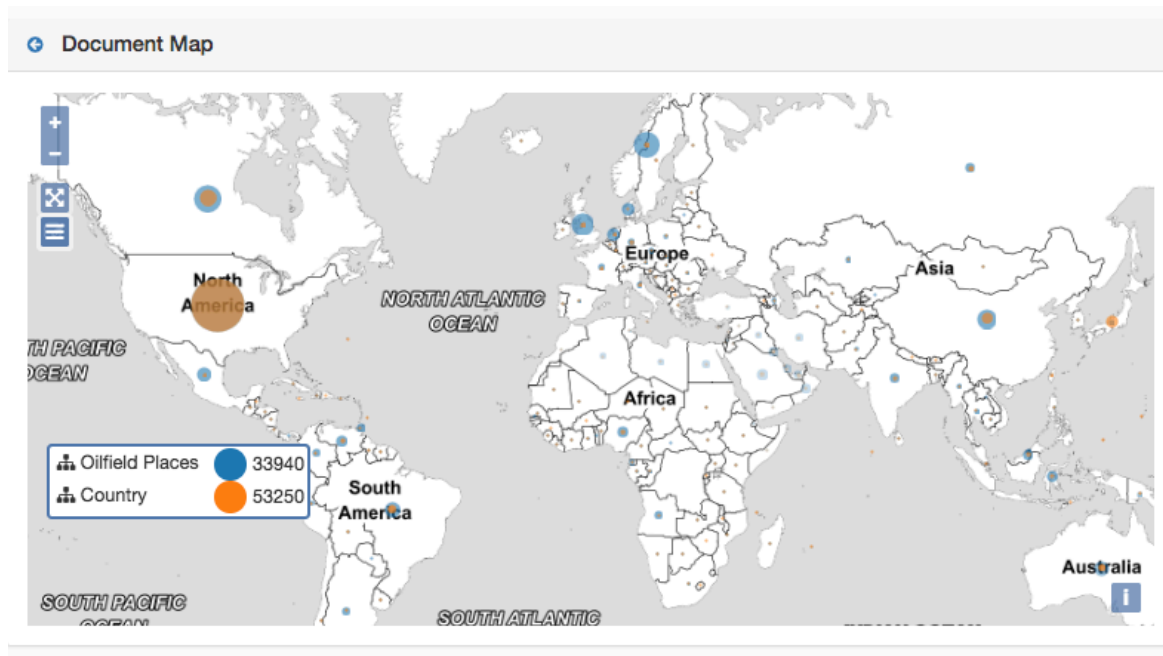
<https://search.spe.org> (For AI: <https://aitopics.org>)

i2k Connect

- Collects content from OnePetro, PetroWiki, SP

Dashboard

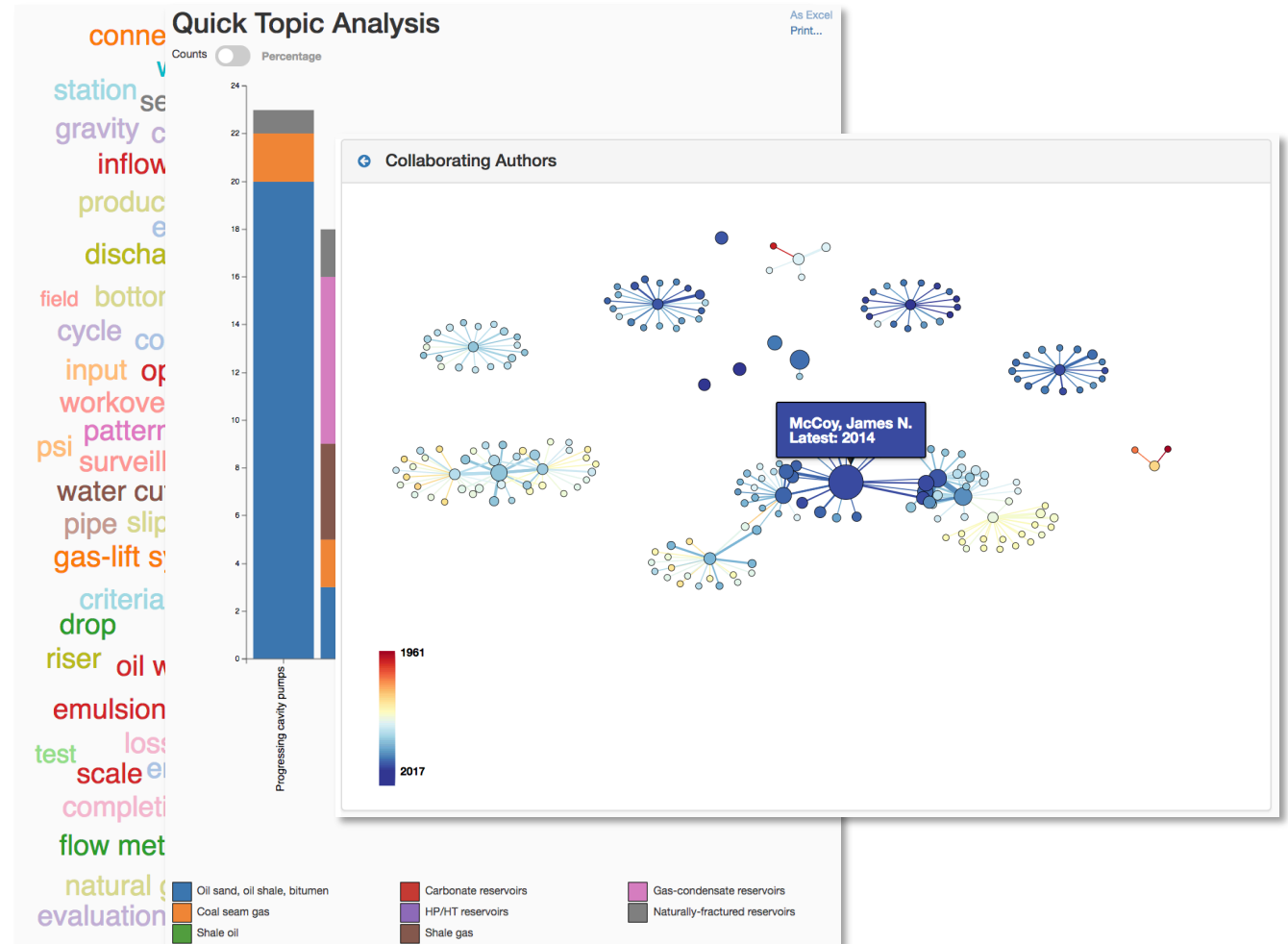
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Map

A screenshot of the i2k Connect search results page. The page features a search bar at the top with the text "New Search" and "powered by i2k Connect". Below the search bar, there are several filters and a "Collaborating Authors" section. The main content area displays a list of search results, including a prominent entry titled "Core analysis" with a sub-header "Development of a Powerful Data-Analysis Tool Using Nonparametric Smoothing Models To Identify Drillsites in Tight Shale Reservoirs With High Economic Potential". This entry lists authors from Texas A&M University and includes a "Quick Summary" section. Below this, there is another entry titled "Sediments Through Digital Rock Technology Core Analysis" with a list of authors from Shell International Exploration and Production. The page also shows a "Page 1 of 96 results" indicator and a "Sort By Relevance" dropdown menu.

- Co-occurring concepts
- Co-occurring classifications
- Collaborating authors
- Trends



- i2k Connect and Schlumberger are delivering structured insights from unstructured data in DELFI.
- The payoff is improved search efficiency and usability, and the ability to leverage quantitative data discovered in documents.
- Our vision:
Eliminate 90% of the manual effort that is today done by knowledge workers to extract and interpret data in documents.