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LLNL-TR-744980

Oil and Gas Well Log Imaging Project Final Report CRADA No. TC-1110-95

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January 23, 2018

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Oil and Gas Well Log Imaging Project

Final Report
CRADA No. TC-1110-95

Date: August 11, 2000 Revision: 3

A. Parties

This project was a relationship between Lawrence Livermore National Laboratory and MJ Systems.

Lawrence Livermore National Laboratory
7000 East Avenue, L-795
Livermore, CA 94550

MJ Systems
5085 Oakland Street
Denver, CO 80239

B. Project Scope

This CRADA's goals were to demonstrate new technology that could maximize the availability of public domain geophysical well data and provide a leap forward in accessibility by oil producers to such information. This project endeavored to reduce the cost of production of geophysical well log information, increase the market base, and improve the functionality of this information.

CD ROM copies for selected fields/plays/basins were provided to MJ Systems for subsequent distribution following successful adaptation of the microfiche information. Each state involved in the project also received a set of CD ROMs of their states' scanned data.

Deliverables and Products (Tangible and Intangible):

- Rasterized well logs from major fields/plays/basins in California, Illinois, and Kansas
- These logs are available on CD ROM and over the Web
- Report evaluating current compression techniques and storage of log raster images
- Report on indexing software for scanning multiple microfiche
- Report evaluating the scanning process using a Sunrise Imaging fiche scanner

C. Technical Accomplishment

The objective of this project was to:

1. Developed a methodology for practical cataloging of microfiche-format geophysical log data used by oil and gas producers.
2. Developed software for data entry and manipulation.
3. Established a database consisting of geophysical logs from several geographical areas.
4. Provided a proof of concept for computer cataloging of geophysical log data
5. Evaluated the capabilities of existing hardware and computing facilities and provided recommendations for areas of improvement.

These goals were met. A procedure was developed for the systematic conversion of microfiche, supplied by MJ Systems, into digital images and for the extraction of auxiliary information. Data from 3 states were cataloged using proprietary software. These data were made available as a demonstration project to the public both on CD ROM and over the Web.

D. Expected Economic Impact

DOE had significant amounts of information recorded on microfiche. The ability to scan, convert to raster, and ultimately digitize the data is very valuable. In particular, it is valuable to the Defense Program archiving efforts.

E. Partner Contribution

The partner, MJ Systems, provided the microfiche masters for the project. MJ Systems personnel also collaborated on the design and development of the indexing software. MJ Systems provided input to LLNL and UCSB personnel continually throughout the project.

Documents/Reference List

Two written reports were completed and submitted to the LLNL Principal Investigator, the Industrial Partner and the DOE.

1) Lee, H., Kent, D., Lewis, W., and Allison, A. (1997). Final report for the project on oil and gas well log imaging. Department of Electrical and Computer Engineering, University of California, Santa Barbara, 27 pp. (July 31, 1997).

2) Lewis, W. and Lee, H. (1997). ScanPal user manual. Department of Electrical and Computer Engineering, University of California, Santa Barbara, 14 pp. (July 31, 1997).

Three CD ROMs were produced.

1) California Well Log Imaging Project, Advanced Computational Technology Initiative (1997). Lawrence Livermore National Laboratory, University of California, Santa Barbara, and MJ Systems (May, 1997).

2) Kansas Well Log Imaging Project, Advanced Computational Technology Initiative (1997). Lawrence Livermore National Laboratory, University of California, Santa Barbara, and MJ Systems (May, 1997).

3) Illinois Well Log Imaging Project, Advanced Computational Technology Initiative (1997). Lawrence Livermore National Laboratory, University of California, Santa Barbara, and MJ Systems (May, 1997).

The logs and data access system are also available on the Web at:

http://wildcat.llnl.gov/OGWLIP/California1/WellLogs.html
http://wildcat.llnl.gov/OGWLIP/Kansas/WellLogs.html
http://wildcat.llnl.gov/OGWLIP/Illinois/WellLogs.html

Patent/copyright activity or pending applications

The indexing software was written by UCSB personnel under a subcontract (IUT) with LLNL.

Subject Inventions
None.

Licensing status of Background Intellectual Property (BIP) and subject inventions

The software has not been licensed to anyone at this time.

G. Acknowledgement

Participant's signature of the final report indicates the following:

1) The Participant has reviewed the final report and concurs with the statements made therein.
2) The Participant agrees that any modifications or changes from the initial proposal were discussed and agreed to during the term of the project.
3) The Participant certifies that all reports either completed or in process are listed and all subject inventions and the associated intellectual property protection measures generated by his/her respective company and attributable to the project have been disclosed and included in Section E or are included on a list attached to this report.
4) The Participant certifies that if tangible personal property was exchanged during the agreement, all has either been returned to the initial custodian or transferred permanently.
5) The Participant certifies that proprietary information has been returned or destroyed by LLNL.

Shelly Pawlak — Date: Sept 25/00
Shelly Pawlak
MJ Systems

Jeffrey Wagoner — Date: 10/9/00
Jeffrey Wagoner
Principal Investigator
Lawrence Livermore National Laboratory

Attachment I – Final Abstract
Attachment II – Project Accomplishments Summary
Attachment III – Final Quarterly Report

Oil and Gas Well Log Imaging Project

Abstract

CRADA No. TC-1110-95

Date: July 27, 2000 Revision: 2

This CRADA's goals were to demonstrate new technology that could maximize the availability of public domain geophysical well data and provide a leap forward in accessibility by oil producers to such information. This project endeavored to reduce the cost of production of geophysical well log information, increase the market base, and improve the functionality of this information.

CD ROM copies for selected fields/plays/basins were provided to MJ Systems for subsequent distribution following successful adaptation of the microfiche information. Each state involved in the project also received a set of CD ROMs of their states' scanned data.

Oil and Gas Well Log Imaging Project

Project Accomplishment Summary
CRADA No. TC-1110-95

Date: August 11, 2000 Revision: 4

A. Parties

This project was a relationship between Lawrence Livermore National Laboratory and MJ Systems.

Lawrence Livermore National Laboratory
7000 East Avenue, L-221
Livermore, CA 94550
Jeffrey Wagoner
Principal Investigator
Telephone: (925) 422-1374
Fax: (925) 422-7438

MJ Systems
5085 Oakland Street
Denver, CO 80239
Telephone: (303) 371-1960

B. Background

Access to information on existing wells is a crucial component of a producer's assessment of the feasibility of purchasing and working an oil or gas well. The geophysical well log is a critical component of information in a decision on the viability of a well. The more effective the access to this information on wells, the greater the likelihood that a wider suite of choices will be considered and a profitable business decision reached by an oil producer.

Independent producers want more effective access to this crucial information to expand their business options and support profitable decisions. Major producers want the independents to have more effective access to this information to facilitate the sale of properties in cases where majors can no longer justify producing from a well, and yet an independent might consider the well still viable. State governments want to see more effective access to geophysical well log information for the independents to avoid the abandonment of wells which could be productive under the right circumstances.

Geophysical well logs are a component of the well records that California and other states keep regarding their respective states' wells. Since 1978, paper well logs have been converted to microfiche by an independent data provider for more convenient commercial access and storage. Copies are also sent to the state. Existing mechanisms for converting from these microfiche files to electronic forms of a raster picture file, and

subsequently to the numerical format required by current analytical programs are too expensive for any data provider to make available on a widespread basis. Additionally, the raster forms require large amounts of storage such that only information on a few hundred wells will fit on a CD and electronic file transfers over a standard modem line will be prohibitively time consuming and expensive.

A pilot program was needed to reduce the cost and storage requirements in providing these electronic well log forms. Such a program could provide the commercial data providers with the market drive to justify expanding their electronic data information availability. Producers would then have ready access to the information needed to increase their ability to find oil and gas at lower costs. This would drive down the cost of acquiring electronic copies of well log images.

LLNL and UCSB provided the computational expertise, and the partner, MJ Systems provided all of the microfilmed geophysical logs.

C. Description

The objective of this project was to:

1) Develop and optimize software for well log raster imaging
2) Optimize the storage and retrieval of the well-log data
3) Provide a pilot which would produce raster well log images of major fields/plays/basins in the U.S., as a means of proving that this information is both vital and can be produced commercially

LLNL provided the supervision and management of the project. LLNL, with assistance from UCSB, provided the computational programming and technical expertise throughout the project. The partner, MJ Systems, provided access to hundreds of microfilmed geophysical logs from 3 oil-producing states. These logs represented real data that were used in the demonstration of the new technology to the oil and gas producers from those states.

1) Develop a methodology for practical cataloging of microfiche-format geophysical log data used by oil and gas producers.
2) Develop software for data entry and manipulation.
3) Establish a database consisting of geophysical logs from several geographical areas.
4) Provide a proof of concept for computer cataloging of geophysical log data
5) Evaluate the capabilities of existing hardware and computing facilities and provide recommendations for areas of improvement.

These goals were met. A procedure was developed for the systematic conversion of microfiche, supplied by MJ Systems, into digital images and for the extraction of identifying auxiliary information. Data from three states were cataloged using proprietary software developed by UCSB, under subcontract to LLNL. These data were made available to the public both on CD ROM and over the Web.

D. Expected Economic Impact

The results of the project were delivered to several companies and organizations in the oil and gas industry in the states of California, Illinois, and Kansas.

This project has demonstrated new technology and new methods of accessing log data. It is up to the industry and the individual state oil and gas regulators to implement these technologies. Quicker and cheaper access to these geophysical data will benefit the independent oil and gas producers.

Access to information on existing wells is a crucial component of a producer's assessment of the feasibility of purchasing and working an oil or gas well. The geophysical well log is a critical component of information in a decision on the viability of a well. The more effective the access to this information on wells, the greater the likelihood that a wider suite of choices will be considered and a profitable business decision reached by an oil producer.

Independent producers want more effective access to this crucial information to expand their business options and support profitable decisions. Major producers want the independents to have more effective access to this information to facilitate the sale of properties in cases where majors could no longer justify producing from a well, and yet an independent might consider the well still viable. State governments want to see more effective access to geophysical well log information for the independents to avoid the abandonment of wells which could be productive under the right circumstances.

E. Benefits to DOE

This project was on-going during the time when LLNL was beginning its digital archiving effort. In fact, the microfiche scanner that was purchased and used during this project was transferred to TID at the conclusion of the project. The scanner, as well as the indexing software, were to be used in the LLNL archiving effort.

DOE has significant amounts of information recorded on microfiche. The ability to scan, convert to raster, and ultimately digitize the data will be very valuable. In particular, it is valuable to weapons' archiving efforts.

F. Industry Area

Oil and gas industry.

G. Project Status

This project was completed in 1997.

H. LLNL Point of Contact for Project Information

Lawrence Livermore National Laboratory
7000 East Avenue, L-221
Livermore, CA 94550
Jeffrey Wagoner
Principal Investigator
Telephone: (925) 422-1374
Fax: (925) 422-7438

I. Company Size and Point(s) of Contact

MJ Systems is a privately held company with annual sales of less than $10 million. The company employs less than 50 people.

MJ Systems
5085 Oakland Street
Denver, CO 80239
Shelley Pawlak
Telephone: (303) 371-1960

J. Project Examples

The log images are available on CD ROM and over the Web.

K. Release of Information

I certify that all information contained in this report is accurate and releasable to the best of my knowledge.

for Karena E Dennice — 10/17/00

Karena McKinley, Director
Industrial Partnerships
and Commercialization

Date

RELEASE OF INFORMATION

I have reviewed the attached Project Accomplishment Summary prepared by Lawrence Livermore National Laboratory and agree that the information about our CRADA may be released for external distribution.

Shelly Pawlak — Sept 25/00

Shelly Pawlak
MJ Systems

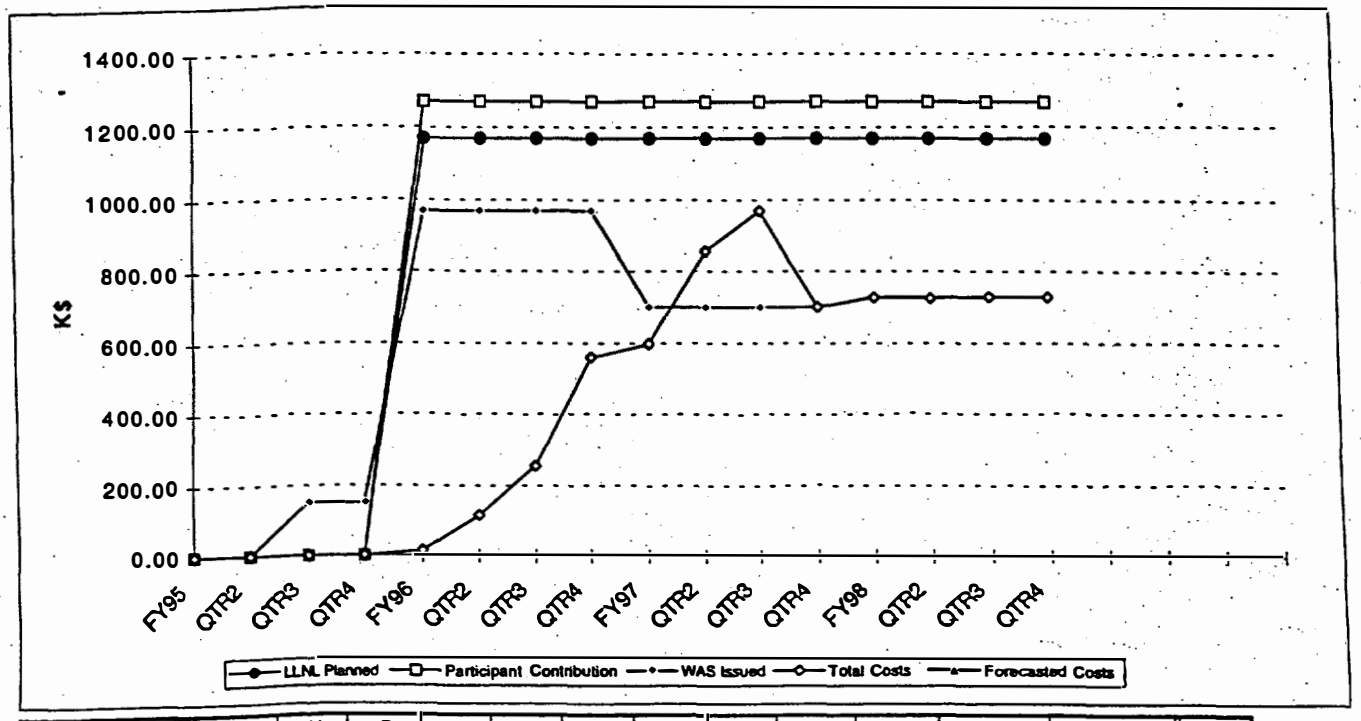
Date

Lawrence Livermore National Laboratory

Title:	Oil and Gas Well Log Imaging Project	Reporting Period:	09/30/96 - 09/30/97
Participant:	MJ Systems	Date CRADA Executed:	11/21/95
DOE TTI No.:	95-LLNL-410-AC	DOE Approval Date:	11/8/95
CRADA No.:	TC-1110-95	Scheduled Ending Date:	11/30/98
Account Numbers:	4786-25, 7516-30	Date Project Completed:	N/A
Date Accounts Closed:	N/A	B & R Code (S):	DP0301, 35DP03

Approved Funding Profile ($K)

	FY95	FY96	FY97	FY98	FYOUT	Total
LLNL Planned	0	1170	0	0	0	1170
Participant In-Kind	0	1270	0	0	0	1270
Participant Funds-I	0	0	0	0	0	0
WAS Operating	150	754	-262	28	0	670
WAS Capital	0	65	-6	0	0	59
Total Costs	0	560	141	28	0	729



DP0301	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	FYTD
FY95	0	0	0	0	0	0	0	0	0	0	0	0	0
FY96	0	2	13	23	21	49	11	46	31	40	74	190	501
FY97	-6	45	-1	50	159	49	51	30	32	45	197	-510	141
FY98	0	3	23	0	-3	0	0	4	0	0	0	0	28
FYOUT	0	0	0	0	0	0	0	0	0	0	0	0	0

670

35DP03	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	FYTD
FY95	0	0	0	0	0	0	0	0	0	0	0	0	0
FY96	0	0	0	0	0	7	0	53	0	0	-1	0	59
FY97	0	0	0	0	0	0	0	0	0	0	0	0	0
FY98	0	0	0	0	0	0	0	0	0	0	0	0	0
FYOUT	0	0	0	0	0	0	0	0	0	0	0	0	0

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STAFF w/phone:

Lab PI: Jeffrey Wagoner (510) 422-1374

Resource Manager: Teri McDonald (510) 422-7700

DOE OAK: Jerry Scheinberg (510) 637-1653

Participant: Shelly Pawlak (303) 371-1960

Address: 5085 Oakland Street

Denver, CO 80239

Milestones and Deliverables:

List the complete set of milestones for all phases of the CRADA. Continue on a separate page if necessary.
Report any changes from the original CRADA or previous quarterly report on the CRADA Change Form.

Completion Date:
Scheduled Actual

See attached report

Verification of participants' in-kind contribution was made in accordance with LLNL policy. Explain basis of verification:

Please initial: YES X NO

MJ Systems provided all hardware/software and participated in regular meetings

List any subject inventions by either party (include IL# for LLNL inventions), additional background intellectual property, patents applied for, software copyrights, publications, awards, licenses granted or reportable economic impacts

Accomplishments

Describe Technical/Non-Technical lessons learned (address and be specific about milestones, participant contributions)
Summarize causes/justification of deviations from original scope of work. Continue on a separate page if necessary.

See attached report

Reviewed by CRADA project Program Manager: _____ Date: _____

Reviewed by Karena McKinley, Director, LLNL/IP&C: Karena McKinley Date: 10/17/00

Direct questions regarding this Report to IP&C Resource Manager, Carol Asher, at (925) 422-7818