

Research and Development Overview



SOUTHWEST GAS

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Topic



- Overview of Southwest Gas
- Safety Commitment
- Research and Development
 - Example projects
- Q & A



Southwest Gas is a Regional Leader in Natural Gas Distribution



- Headquartered in Las Vegas
- Largest distributor of natural gas in Arizona and Nevada
- Distributes and transports natural gas in parts of California
- **1,938,000** customers in service territory
- **189,000** in California
- Over **99%** of customers are residential and commercial



OUR COMMITMENT TO SAFETY – “YOUR SAFETY, OUR PRIORITY”



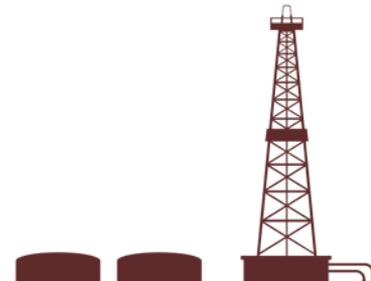
Southwest Gas (Company) is dedicated to providing safe and reliable natural gas service. The safety of our workforce, customers and communities is the top priority of the Company. While we believe we have an excellent safety record, we continuously strive to improve our operations by evaluating industry best practices, and by considering the lessons learned from pipeline incidents across the country.





Research & Development

- Integrity Management and Automation
- Pipe Materials, Repair, and Rehabilitation
- Operations Infrastructure Support
- Testing and New Materials
- Environmental
- Pipe Location and Leak Detection



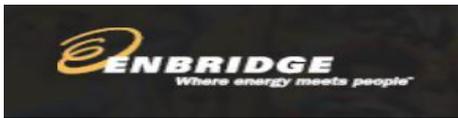
OTD

Operations
Technology
Development



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Integrity Management & Automation



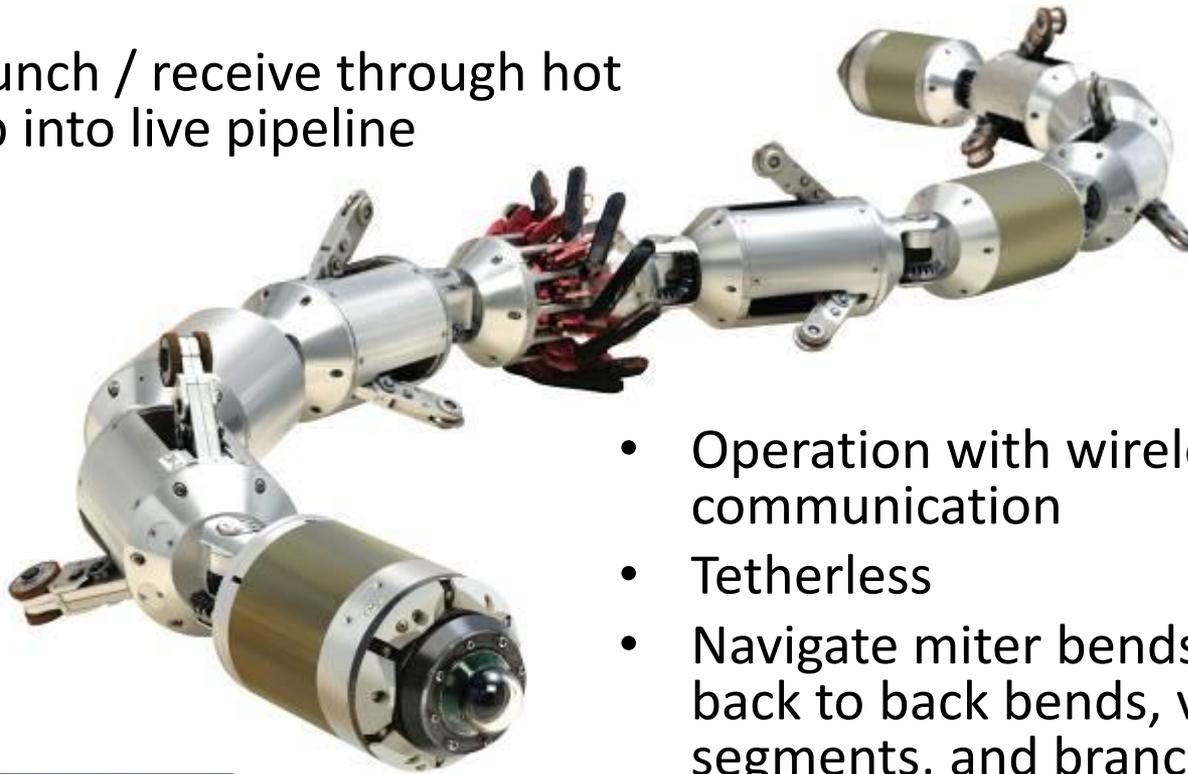


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Robotic inspection platform

EXPLORER 6"-36"

- Launch / receive through hot tap into live pipeline



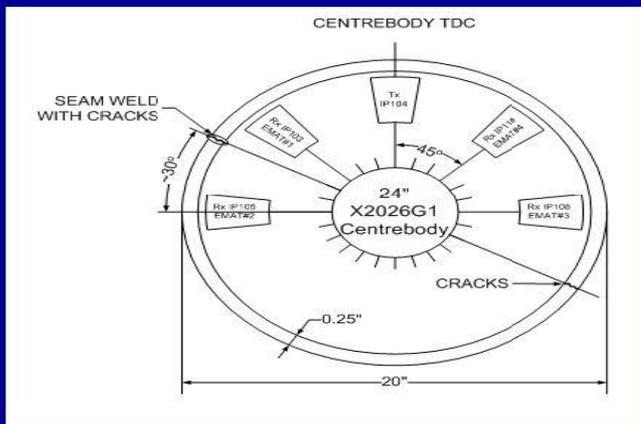
- Operation with wireless communication
- Tetherless
- Navigate miter bends, valves, back to back bends, vertical segments, and branch connections



Robotic inspection platform

EMAT System

- Focus on optimizing number of transceivers and receivers
- Two transceivers – four receivers configuration tested at RG&E



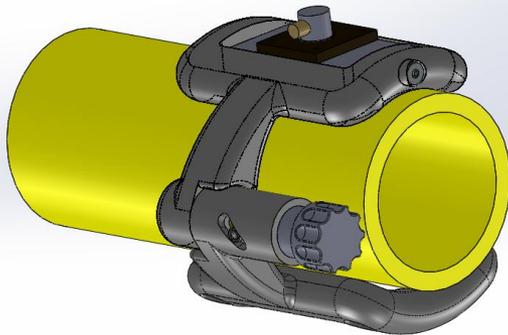
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Proprietary & Confidential

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Detecting Driscopipe 8000 High Density Polyethylene Pipe of the Potential for Material Degradation

Docket No. PHMSA–
2012–0044 issued
March 6, 2012



External tool- detect Driscopipe 8000 High
Density Polyethylene Pipe



Interactive Threat Project



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Project Threats Matrix

CD	Construction Damage
CW	Cold Weather
DFW	Defective Fabrication Weld
DGW	Defective Girth Weld
DP	Defective Pipe
DPS	Defective Pipe Seam
EC	External Corrosion
EM	Earth Movement
GF	Gasket Failure
HRF	Heavy Rains/Floods
IC	Internal Corrosion
IO	Incorrect Operation
LIGHT	Lightning
MCRE	Malfunction of Control/Relief Equipment
MISC	Miscellaneous
PDP	Previously Damaged Pipe
SCC	Stress Corrosion
SPPF	Seal/Pump Packing Failure
TP	Third Party
TSBPC	Threads Stripped, Broken Pipe Coupling
UNK	Unknown
V	Vandalism

Table 3. Incidents due to Interacting Threats

		0353-1102 Draft Results for Phase 3: Review DOT Incident Database 1984-2011 "Combined"																		Total			
		EC	IC	SCC	DP	DPS	DFW	DGW	CD	MCRE	TSBPC	GF	SPPF	IO	TP	PDP	V	EM	HRF	LIGHT	CW	MISC	Total
EC				4	1	21		4	1	6		2		7	2	3		1	1			2	57
IC					11				7	1						1							20
SCC				1												5						2	8
DP					1				2	1												1	5
DPS										1				1				1				1	4
DFW									1		1			1	6			7	2		1	4	23
DGW									1	1				1	2			19	11		2	1	37
CD												5						3	1				9
MCRE												7	3	1	5	1			5	7	17	4	50
TSBPC																3	12		14	18	3	1	51
GF															8	2		1	1	2	2	1	17
SPPF																							0
IO															4						1	1	6
TP																1		2	17				20
PDP																		2	1			1	4
V																							0
EM																			10		1		11
HRF																					2		2
LIGHT																							0
CW																							0
MISC																							0
																							324

Table 4. Summary of Threat Interactions Simplified to 9x9 Matrix

		0353-1102 Interacting Threats Table								
		Time-Dependent			Stable			Time-Independent		
		EC	IC	SCC	MFR	CON	EQ	IO	TPD	WROF
		1	2	3	4	5	6	7	8	9
1	EC			1	1	1	1	1	1	1
2	IC				1	1	1	1		
3	SCC				1	1	1	1	1	1
4	MFR				1	1	1		1	
5	CON					1	1	1	1	1
6	EQ						1	1	1	1
7	IO							1		1
8	TPD								1	
9	EM									1







Cross Bores Best Practices Guide & Videos



- How To Videos
 - Plumber
 - Homeowner
 - Field Crews

Operations Infrastructure Support



Key Hole Technology



Acoustic Pipe Locator (APL)



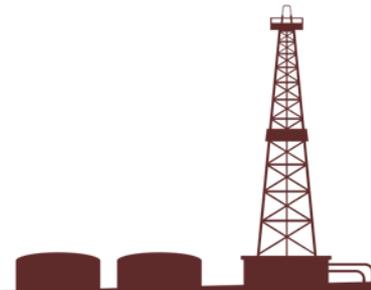
SENSIT Technologies
SENSIT's ULTRA-TRAC® APL acoustic-based pipe locator



Metallic Joint Locator (MJL)



SENSIT Technologies
The SENSIT Ultra-Trac® MJL





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Remote Methane Leak Detector (RMLD)





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Summary

- Southwest actively engage in Research and Development (R&D) within the industry
- R&D projects in key focus areas
- Leverage R&D dollars to improve safety and reduce cost of operations





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QUESTIONS?

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