Sustainable Infrastructure Task Force

May 19 1:30 to 3:30 pm
Carnegie Mellon University

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Qualifications and Experience

- Founded in 1987
- Spin Off - Carnegie Mellon University
- Past Robot Development Clients
  - Department of Energy (DoE), Department of Defense(DoD)
  - Boeing, Lockheed Martin
- Over 45 robot designs
- In 2003 - Technology transfer from nuclear to wastewater

RedZone ‘s Reach and Client Base

- Over 65 US and Canadian Wastewater Clients
  - ALCOSAN – Pittsburgh, PA
  - PWSA - Pittsburgh
  - New York, NY
  - Chicago, IL
  - Los Angeles, CA
  - Houston, TX
  - King County – Seattle, WA
  - Baltimore, MD
  - DCWASA – Washington, DC
  - San Jose, CA
  - Ft. Worth, TX
  - Cleveland, OH
  - Toronto, Canada
- Over 85 Engineering & Contracting Partners
- International - Singapore, Hong Kong, and Malaysia

alcosan allegheny county sanitary authority ™
environmental excellence beyond clean water...

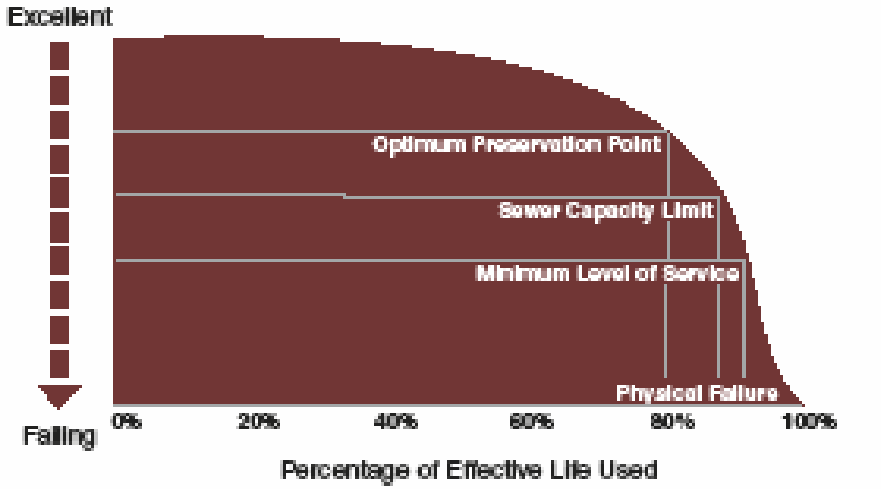
FORT WORTH

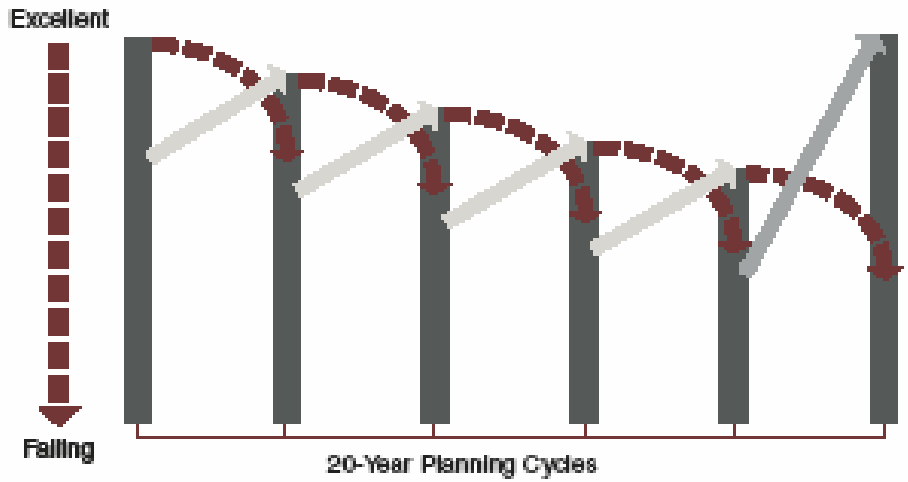
King County

CITY OF SAN JOSE - CAPITAL OF SILICON VALLEY

TORONTO

Challenges Owners/Operators Face

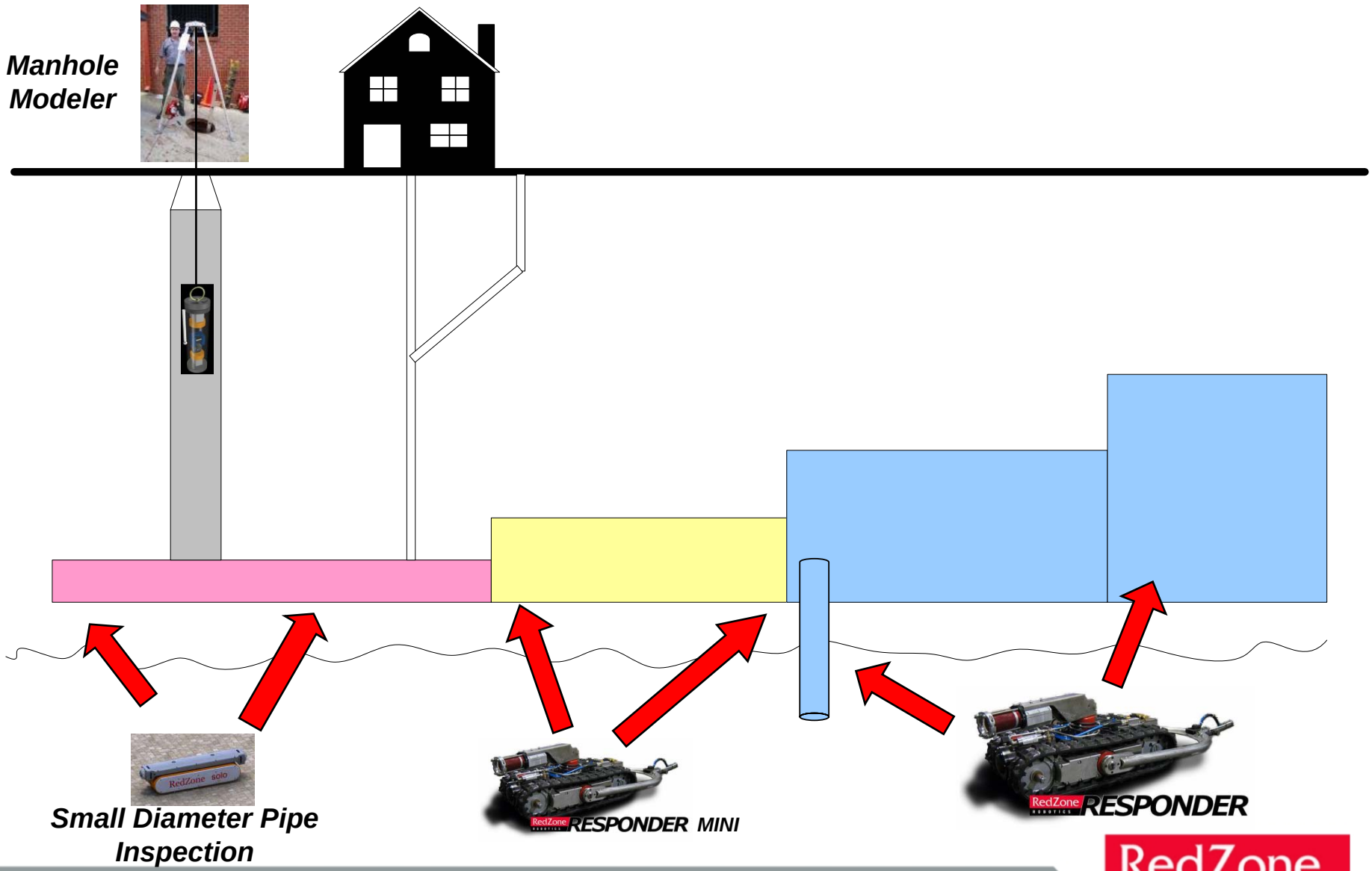




- It is all about making an informed decision
  - Asset identification and valuation
  - Failure impact evaluation and risk management
  - Condition assessment
  - Rehabilitation and replacement planning
  - Capacity assessment and assurance
  - Maintenance analysis and planning
  - Financial management

You can't manage what you can't measure

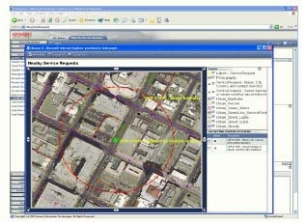
Wastewater Pipe End to End Digitization

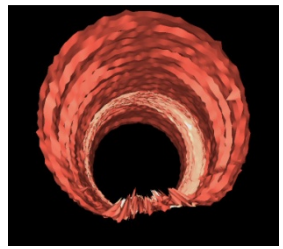


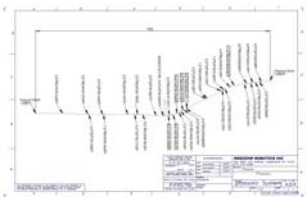
Small Diameter Pipe Inspection

Repeatable Infrastructure Information Collection/Analysis/Archive

Collect → **Analyze** → **Archive** → **Export**







- Good system planning starts with digital data collection

End to End - Analog vs. Digital Information

Analog

- Store/Play approx.20 soundtracks
- Manual search and play
- Possible skipping with movement

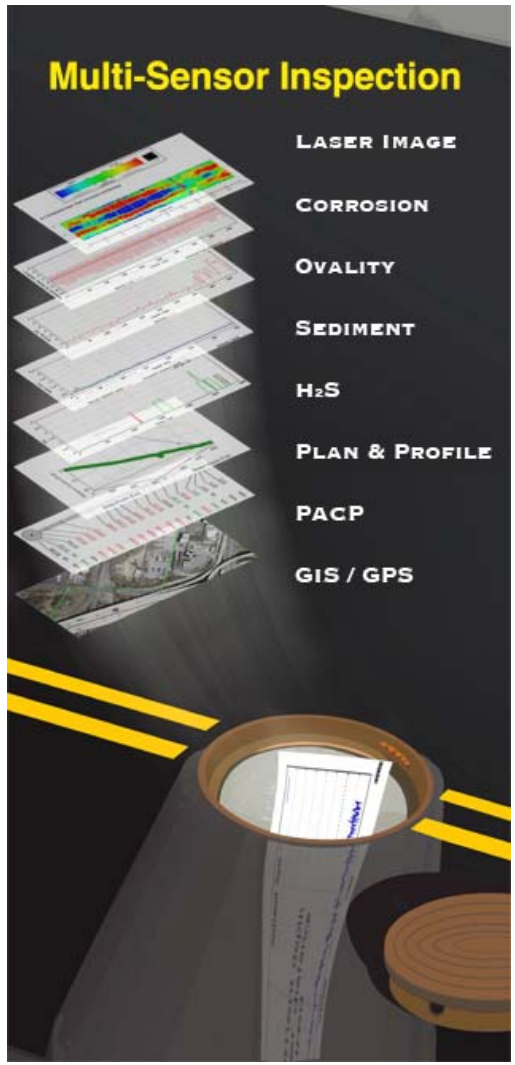
Digital

Apple

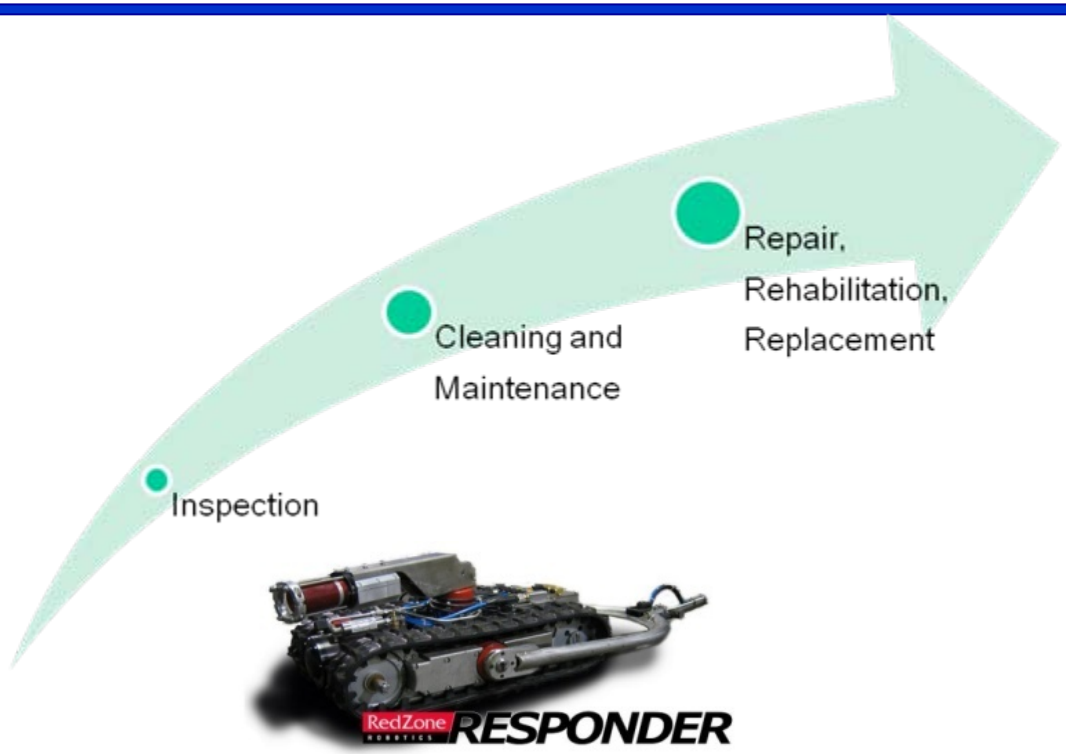
- Store/Play approx.20,000 soundtracks
- Full programmable search and play
- Never misses a beat

Optimize and Allocate Spend by ROI

- Most management today is reactive
  - Failure data is too late
- Monitor pipe changes throughout its lifecycle - Baseline:
  - New installation
  - Operations & maintenance
  - Repair & rehabilitation
- Emphasize Cost Optimal Solutions – Lifecycle Cost
  - Predictability Index
  - Preventability Index



Robotic Technologies is Just Starting to Impact



- Benefits
  - Reduced $/ft over time & increase in efficiencies
  - Increase water quality over time
  - Discontinuous impact on uptime/operations

Increase State Revenues and Reduce Costs

- The Goal: to improve aging and deteriorating water and sewer lines
  1. Provide funding to encourage PA authorities to become leaders in asset management and condition prediction
  2. Assist in the baselining of all pipes for true benchmarking and time based analysis of our infrastructure
  3. Support new technology implementation programs to solve water and wastewater expensive cleaning and rehab challenges
  4. Enable Pennsylvania to leverage innovations locally and export the solutions world-wide
  5. Leverage information to make the best and most cost effective decisions for PA Infrastructure spending

Appendix

Typical Challenges Asset Owners Face

- "We have a hard time inspecting siphons, river crossings, outfalls, and difficult to access pipe"
- "I don't know if my cleaning projects were performed to specification"
- "It is difficult to avoid pipe bypassing during large diameter pipe inspection"
- "I am currently guessing on my sediment quantity when bidding out cleaning projects"
- "The quality of my CCTV is poor and it's too time consuming to compare my old inspection tapes to current tapes"
- "I need to inspect more pipe per year for less cost"
- "I need to decide on a best rehab method for this pipe"

Service Offerings

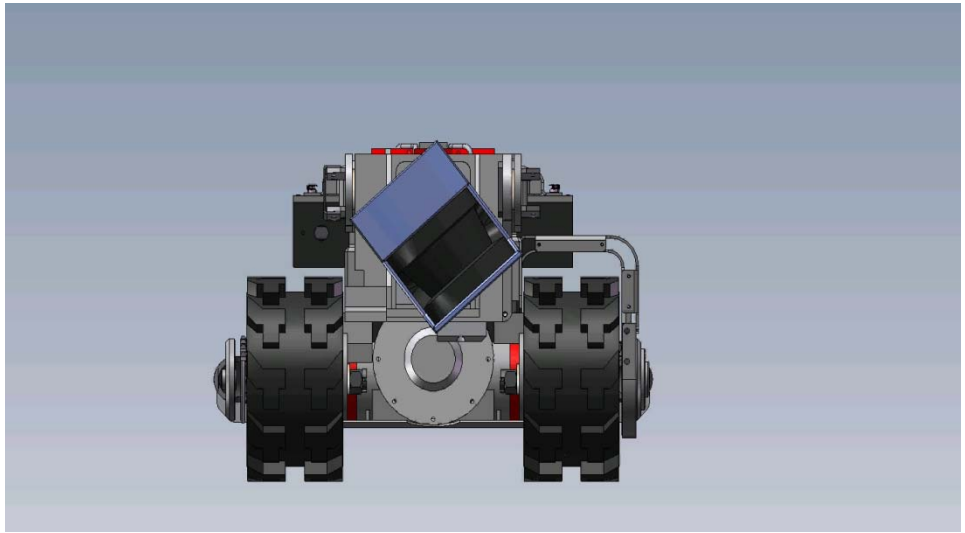
- New Installation:
  - As-built drawing generation
  - Contractual verification
  - Post inspection eccentricity and deformation measurement

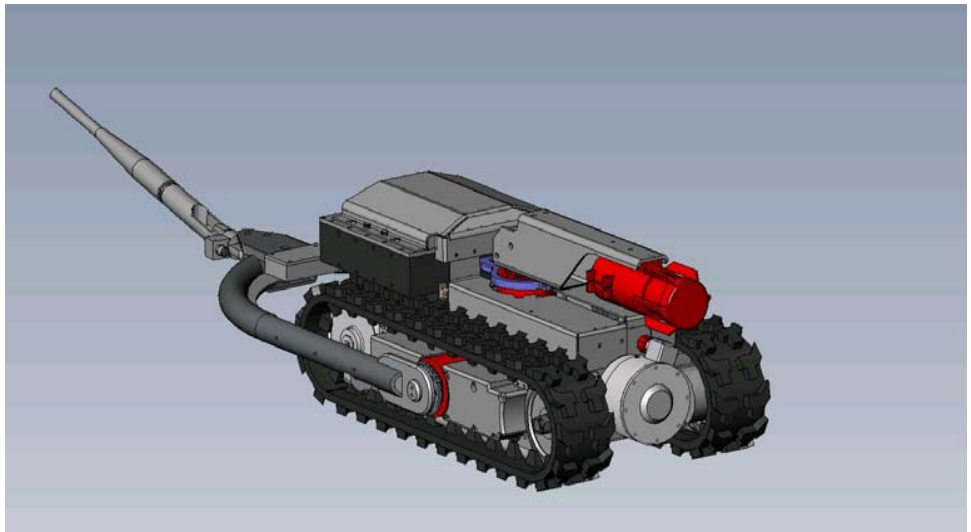
- Operations and Maintenance:
  - Sediment quantity and location
  - Pipe loss measurement
  - Defect identification
  - Pipe geometries and metrics

- Rehabilitation:
  - Accurate pipe diameter & defect sizing
  - CIPP & sliplining specification and bid package
  - Benchmarking finished product

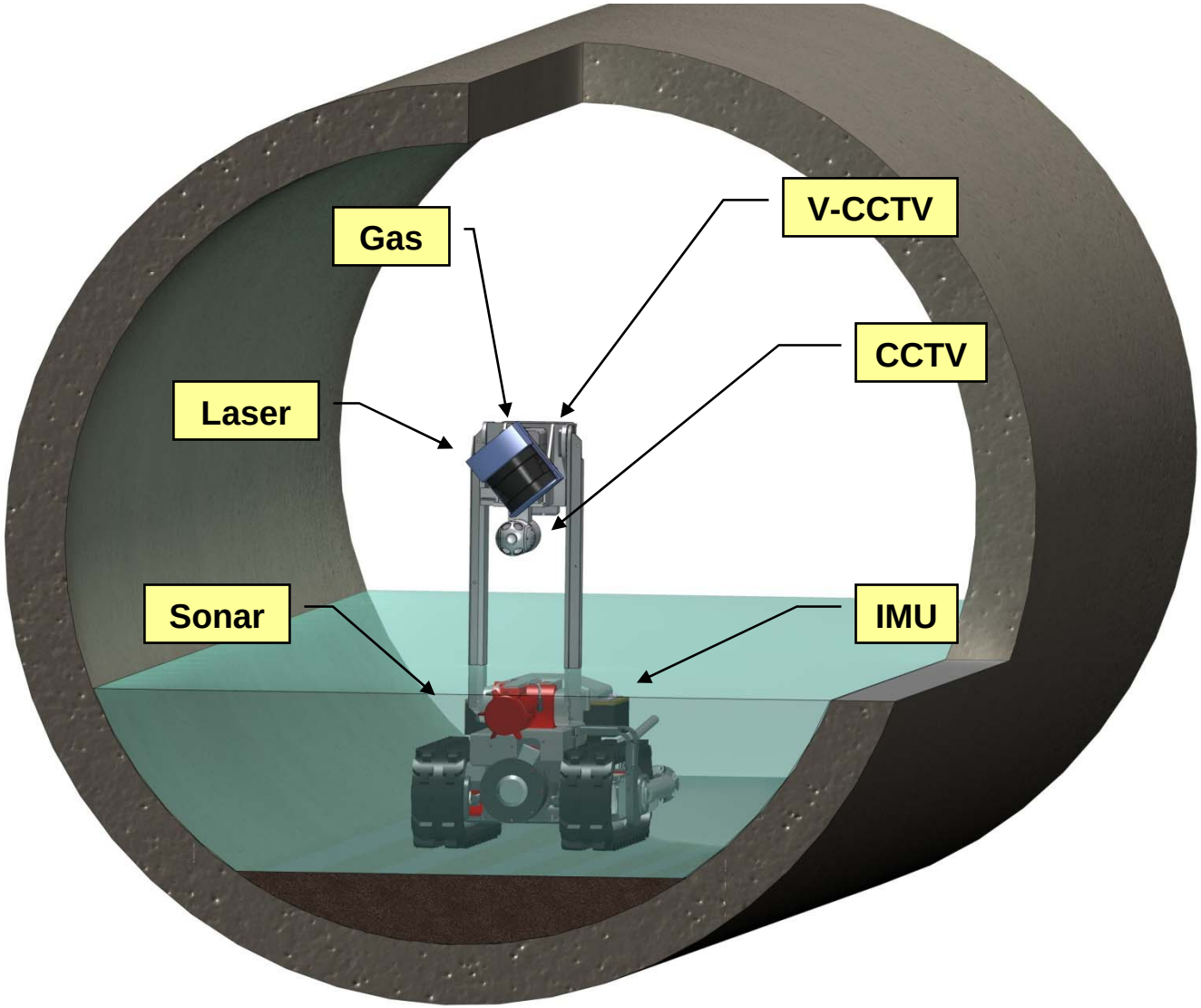
RespohnderSpecifications

Cable Functions	•Electrical Power •Data Communications •Strength Member
Dimensions	22.5” W x 36” L
Weight	600 lbs
Motion	•6 Axes controlled motion •Turret, yoke, tracks
Computing	•On board computer •100% digital •Plug and play sensors •Up to 15 sensors
Power	•Up to 10 HP •Hydraulic





Synchronized Data Collection

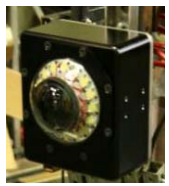


LASER

DATA SYNC

SONAR

CCTV



V-CCTV

GAS