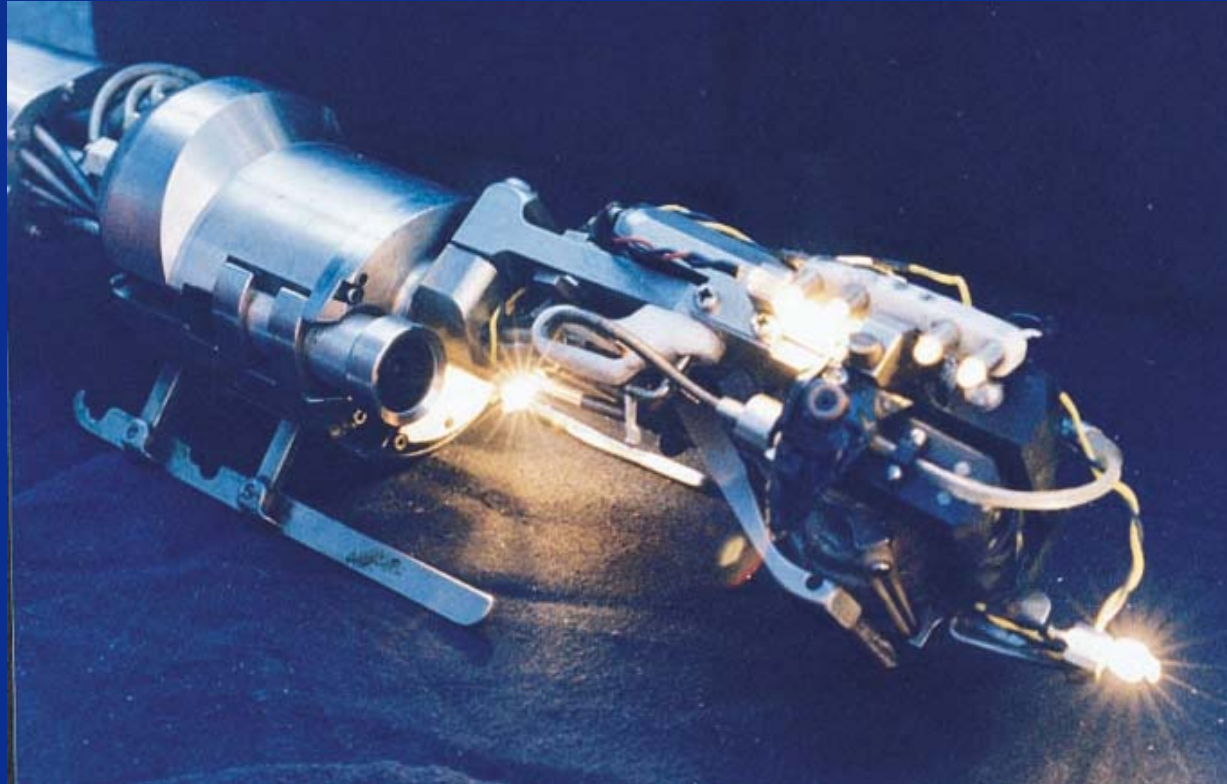
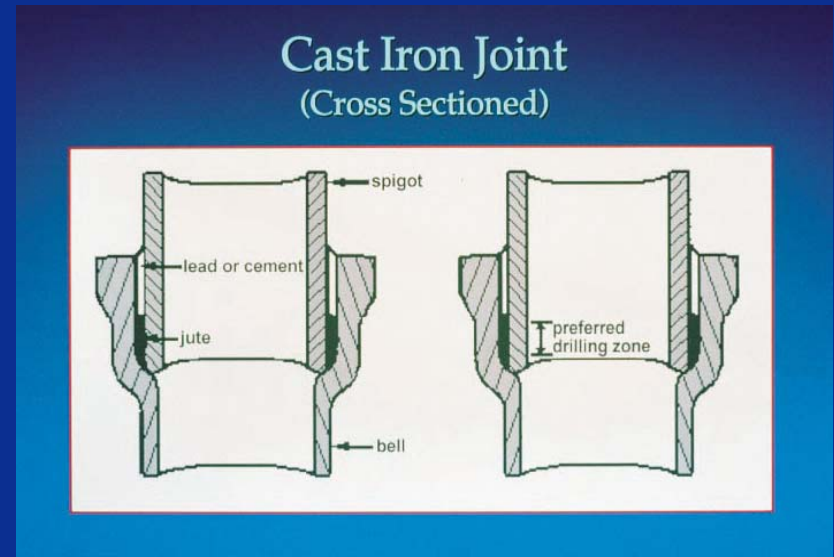
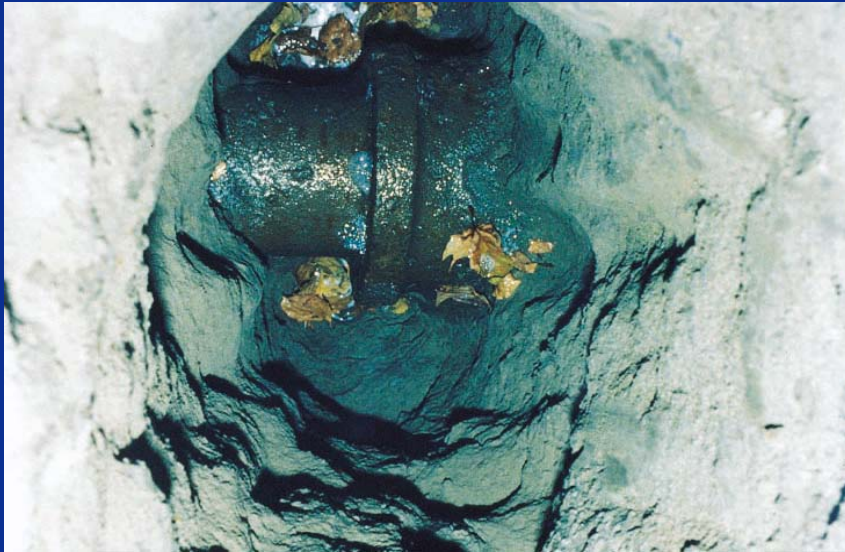


CISBOT – Cast Iron Joint Sealing Robot



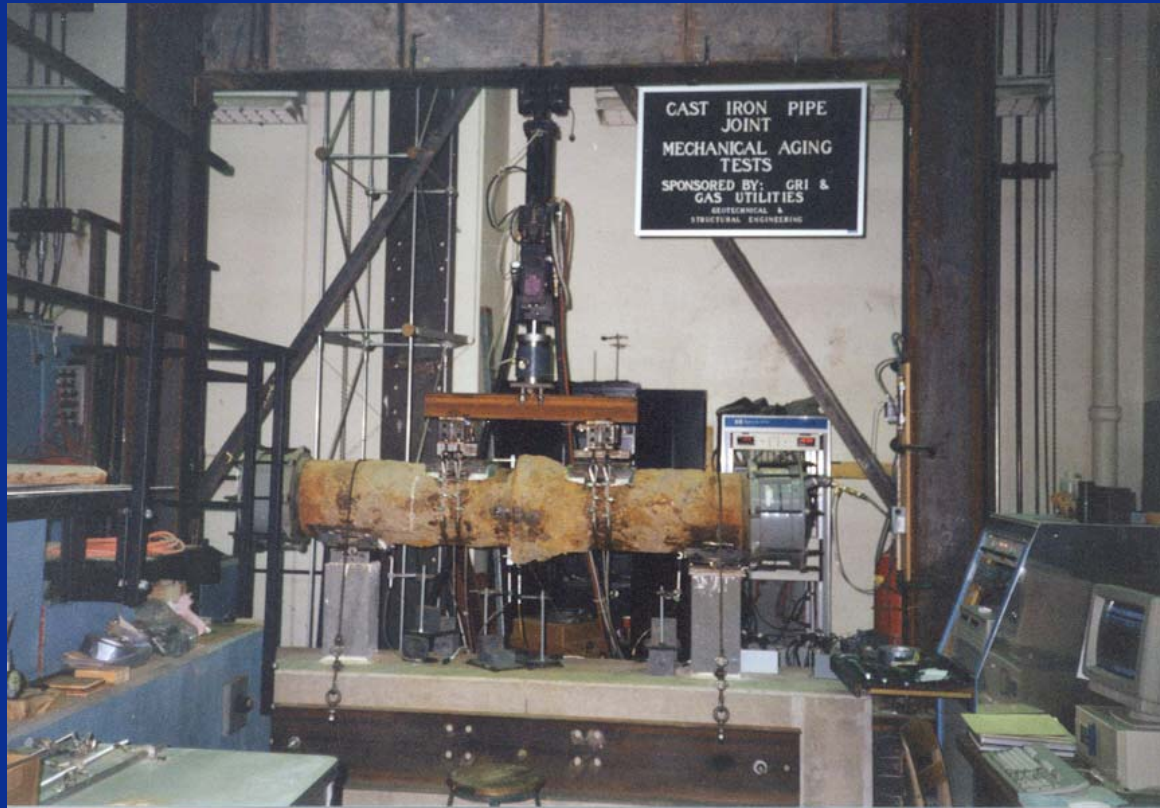
- **Seals Bell & Spigot Joints in Live 6" Cast Iron Gas Mains**
- **Reaches 150' in 2 Directions to Seal 25 Joints from One Excavation**

CISBOT – Cast Iron Joint Sealing Robot



- **Con Ed's LP Gas System**
 - 47% is 6" Cast Iron
 - Seal over 2,500 6" joints/year
- **Want to inject Anaerobic into Jute**
 - Internal versus External

CISBOT – Cast Iron Joint Sealing Robot



- Cornell Study

–50 Year Longevity Proven

CISBOT – Cast Iron Joint Sealing Robot



- **Contract with ULC Robotics**
- **Con Edison digs 7' excavation and installs fitting**
- **ULC Robotics operates and maintains robot**

CISBOT – Cast Iron Joint Sealing Robot



- **Developed fitting with IPSCO**
 - 45 degree entry with balloon stopper hole
- **Approved to remain on main**
 - No-Blow operation
 - Work live with no service interruption and no main cut-out

CISBOT – Cast Iron Joint Sealing Robot



- **Developed drill system with IPSCO**
 - **Weights 90 lbs.**
 - **Takes less than 5 minutes to make cut**
 - **45 degree cutting angle**
 - **4" shell cutter**
 - **$\frac{3}{4}$ " end mill to catch coupon**

CISBOT – Cast Iron Joint Sealing Robot



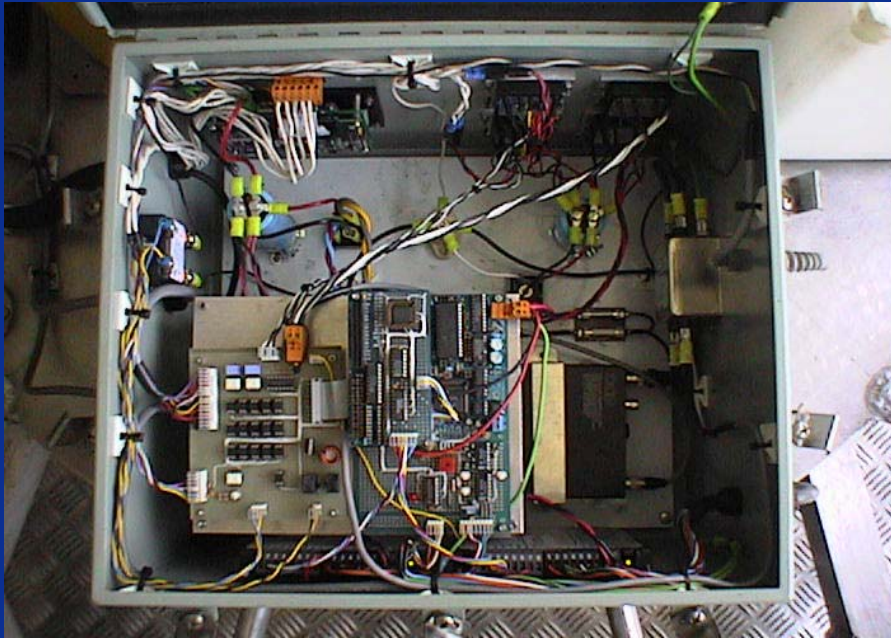
- **Install launch tube housing robot**
- **Mount power motor that pushes umbilical**

CISBOT – Cast Iron Joint Sealing Robot



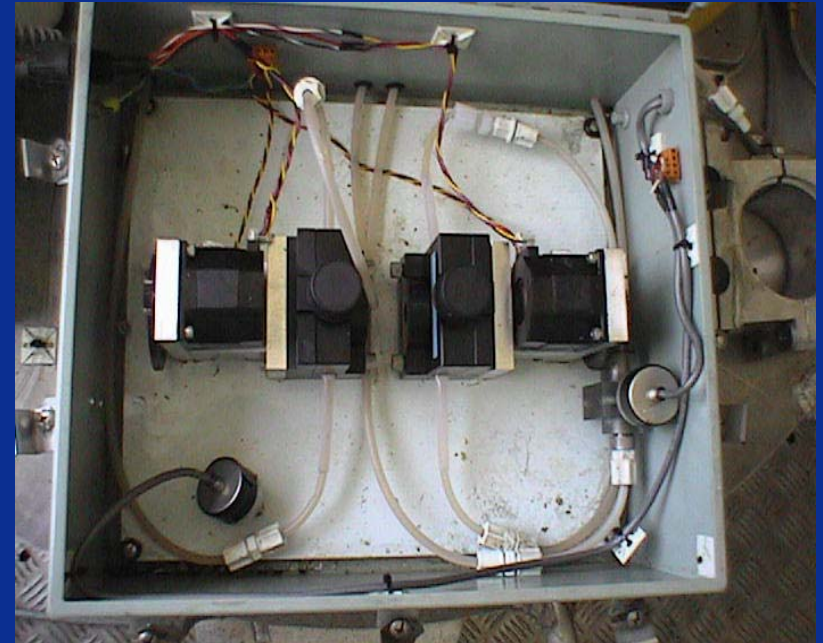
- **Turret Station holds:**
 - **Umbilical Cable**
 - **Electronics and Pneumatics**
 - **Anaerobic Sealant**

CISBOT – Cast Iron Joint Sealing Robot



- **Electronic Brain**

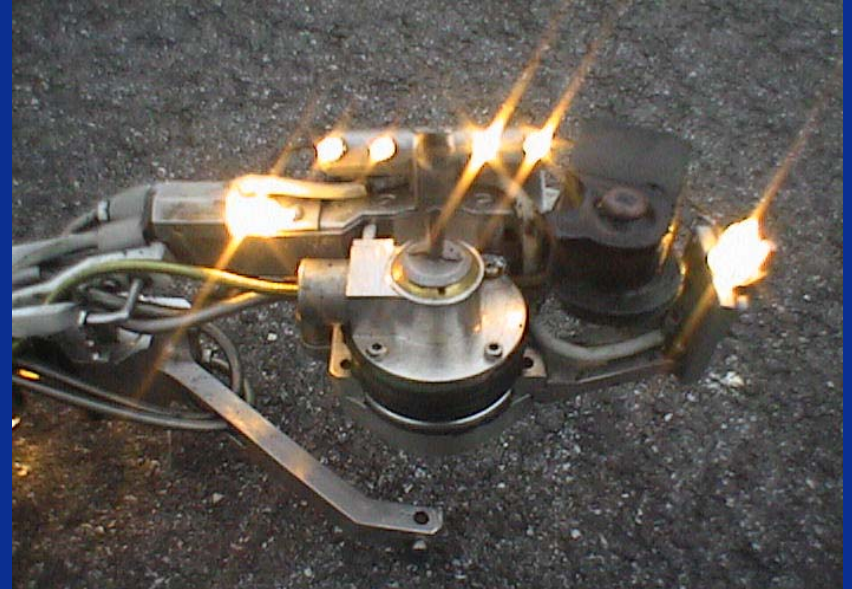
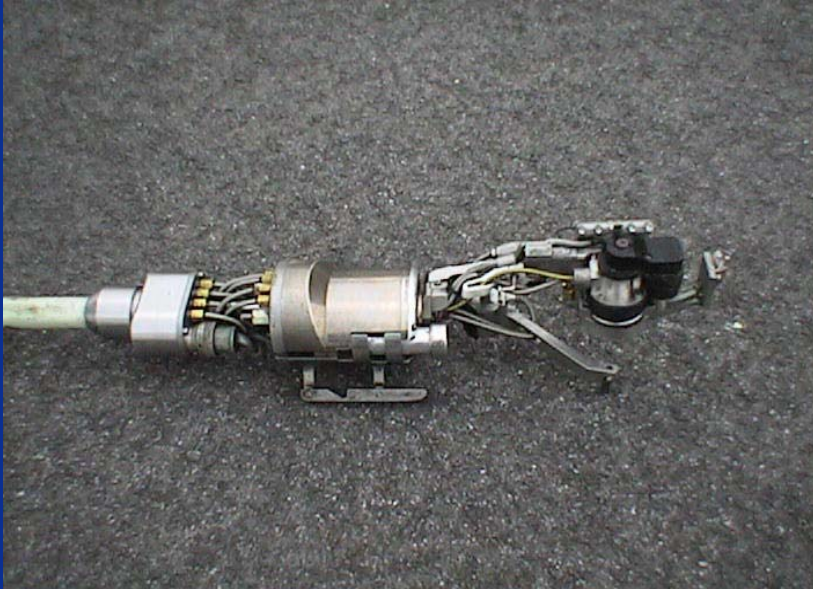
- Receives signal from operator
- Uses feedback control to/from robot



- **Peristaltic Pumps**

- Delivers exact amount
- Pressure and Flow controlled

CISBOT – Cast Iron Joint Sealing Robot



- **CISBOT Tool Head**
 - Slides along bottom of main on skis
 - 3 traveling lights for viewing
 - 4 pointer lights for positioning at joint
 - Arms lock tool head
 - 3/16" Drill and 3/8" Chamfer
 - Nozzle for injection of Anaerobic

CISBOT – Cast Iron Joint Sealing Robot



- Inside gas main
- Just finished drilling
- Notice joint crack and shiny chamfer hole

CISBOT – Cast Iron Joint Sealing Robot



- ULC Robotics Operator **hard at work**
 - Watches video monitor
 - Uses control pad to operate robot

CISBOT – Cast Iron Joint Sealing Robot



8" to 12" Adjustable Tool Head

- same umbilical and support equipment
- larger arms, drill and body

CISBOT – Cast Iron Joint Sealing Robot



12" IPSCO Fitting

- 6" Shell Cutter
- same launch tube
- 30 degree angle

The Future

- Developing a fitting to be used on main cutouts and encroachments
- Medium Pressure CISBOT
- 16" & 24" CISBOT