• Broker of Analytical Services
  – Partner with over 300 analytical labs
    • Bulk Analysis
    • Microscopy
    • Surface Analysis
    • Polymers
    • Liquids/Gases
    • Electrical
  – Complete listing of techniques at www.mat-cs.com
So, you need to analyze something

- Reasons for Materials Analysis
  - Failure Analysis
    - Product returns
    - Production interruption
  - R&D
    - Any kind of Materials based industry: Semiconductors, Consumer products, Pharmaceuticals, Automotive, Plastics & Polymers, Oil & Gas, etc.
  - Regulatory
    - Toxicity, FDA, Milspec, EPA, RoHS, REACH, Prop65, etc.
  - Meet a customer spec
    - ASTM, ISO, Milspec, customer spec
  - Reverse engineering, deformation
  - Legal
    - Liability, patent infringement, Federal Trade Commission
The Laboratory Landscape

• Giant lab conglomerates (>1B sales)
  – Eurofins, Intertek, Element, SGS
    • Hundreds of labs each, generally grown by acquisition
    • Great websites, and lots of techniques, but can be very
difficult to deal with and find what you want

• Mid to small labs
  – Jordi Labs, IMR, Oneida Research, ARL
  – Specialized focus (polymers, metallurgy, hermeticity, reliability)
  – Easy to work with, but may have limited capabilities
    (everything looks like a nail when you only have a hammer)
• Mom & Pop labs
  – ODA, Geller MicroAnalytical, Chemtos, Future Labs
  – Optical, EPMA, NMR, Road surface coatings
  – They typically do only one thing, but do it very well.
  – May be the only lab that does a particular analysis.

• Universities
  – ASU, Michigan, Illinois, Penn State
  – High end, unique analysis
    • Outgassing, Cryo-TEM, PALS, (typically specialized tools)
    • Some are professional, some are not
  – Routine analysis
    • May be cheaper, but “you get what you pay for”
    • Unfair competition?
– Environmental
  • EPA test methods, routine testing, tight quality controls
– Medical Devices
  • Typically toxicity and performance/reliability related.
  • FDA oversight, GMP/GLP quality, more specialized and difficult testing
– Pharmaceutical
  • FDA oversight for production (GMP/GLP), but may need extra capabilities for R&D
– Exposure testing
  • Animal testing for food safety, nutraceuticals, pharma
– Other
  • RoHS, REACH, Prop65
Lab Cultures

- **Quality Driven (regulatory)**
  - Technicians doing analysis, with supervision by QC manager.
  - Everything is heavily documented and tracked.
  - Analyses are done “by the book”
  - Turn time generally not a priority

- **Industrial**
  - May do both prescribed analysis (ASTM) and have a few specialties.
  - Likely to have competition, so price and/or turn time oriented

- **Specialty (R&D, high tech)**
  - Focus is on technical capability (instrumentation and staff knowledge).
  - Quality systems may vary
  - Turn time can vary significantly depending on industry served
Transactional vs Solutions

- **Transactional lab**
  - Order from the “menu”
  - They provide data, not solutions
  - Experts on the analysis, but maybe not on the materials
  - ~90% of labs fall into this category

- **Problem solving lab**
  - Focused on solving your problem
  - Experts on materials and analysis techniques
  - May use other labs to provide needed methods
  - Provides more value, so higher cost
Why Use a Broker

Tests can be hard to find

- Large lab conglomerates can be impenetrable
  - Great web sites, but lousy customer service
  - >1 week response time to web inquiries
- Specific test method may exist, but no labs to run them?
  - ~13,000 total ASTM methods
  - MAT-CS can cover ~1,800 of them
- You have a specific need:
  - Accredited lab
  - Specific quality systems (GLP, GMP, USP, etc.)
  - A “solution” rather than just data
  - Expert witness, legal level documentation & attitude
  - Specific location (same day turnaround, on-site analysis)
Experienced Scientists

– You may not know which technique is the best to answer a particular question
  • MAT-CS has 64 years of combined analytical experience
  • Expert in experiment design and technique selection
  • 41 years of in-lab experience

– Objective and Independent
  • Able to select the most appropriate technique/lab for each analysis
  • Labs often try to sell their own techniques instead of the best one

– Able to offer competitive pricing through multi-lab comparison
• Every technique has different strengths/limitations
• Choice is affected by the material tested, and many other factors
Innovative Designs Inc (IDI) makes a commercial “house wrap” called Insultex (similar to Tyvex)

Their wrap is unique- it is a ~1mm thick foam with vacuum inside the cells

IDI advertised that their wrap was insulating and had an R value (as measured by another lab)

Competitors complained to the FTC that the IDI advertising was “false”

IDI needed to prove that the cells of their foam contained vacuum

MAT-CS partnered with a hermeticity lab to test the foam
• How do you prove that there is vacuum inside the cells of a foam?
How do you prove that there is vacuum inside the cells of a foam?

*Put it in a sealed vessel, and melt the foam.*
• Foam before melting
• Foam after melting
• Compare pressure after heating to 200°C
• As temperature rises, pressure rises (PV=nRT)
• Reference foam and empty chamber show same final pressure
• Insultex foam shows lower final pressure
• Conclusion: the cells of the test foam contain vacuum
Chamber Pressure and Temperature versus Time
(both samples consist of ~10.6g of foam)

- Argon (no sample)
- Amazon in Argon
- Insultex in Helium
- Insultex in Argon
- Temperature

Pressure (torr)

Temperature (Celsius)

Time (Minutes)
• Contacted by semiconductor producer looking for “PALS” analysis
• What the *&#@*%* is PALS???
• PALS: Positron Annihilation Lifetime Spectroscopy
  o Can be used to determine porosity of thin films
  o Available at the University of Michigan
• MAT-CS set up agreement with U-Mich, and has brokered several jobs since
Example Analysis - PALS
Example Analysis - PALS
Partnering with ARL

- Customer makes electronic price tags for auto sales
- Was seeing failures in the field, and wanted to simulate prolonged exposure to summer heat on samples with/without a protective coating
Partnering with ARL

• ARL designed an experiment and ran exposure tests on 2 rounds of tags

• Results showed how different treatments affected darkening of the surface of the tag and electronics lifetime
The Downside of Brokering

- MAT-CS has a reputation for handling difficult and unusual analyses
- Other labs refer customers to us when there’s nowhere else to go
- We end up with some customers with unreasonable expectations
- Some are just plain crazy!
Customer referred from another lab
Wanted to do SEM analysis of human blood (unusual request)
  - Labs that do SEM don’t handle biohazards
  - Labs that handle biohazards don’t do SEM
Decided to Google “Bodie Witzlib”
The Legend of Bodie Witzlib

Bodie Witzlib

Bodie Witzlib federally charged in Germantown explosives case
Questions we ask:

- What is the purpose for the analyses?
  - Meet a spec, test incoming product, R&D, etc.?
- Are there specific test methods that need to be followed?
  - (ASTM, ISO, JEDEC, etc.)?
- How many samples/materials do you need to analyze?
- Are the materials being analyzed hazardous?
  - Can you provide an SDS?
- Any other special requirements
  - Specific sensitivity or detection limit
  - Deadline or turn time requirement
  - Lab accreditation, quality system needed

More Information is Better!!!