Onshore Environmental Research and the Concept of Generic Drilling Fluid

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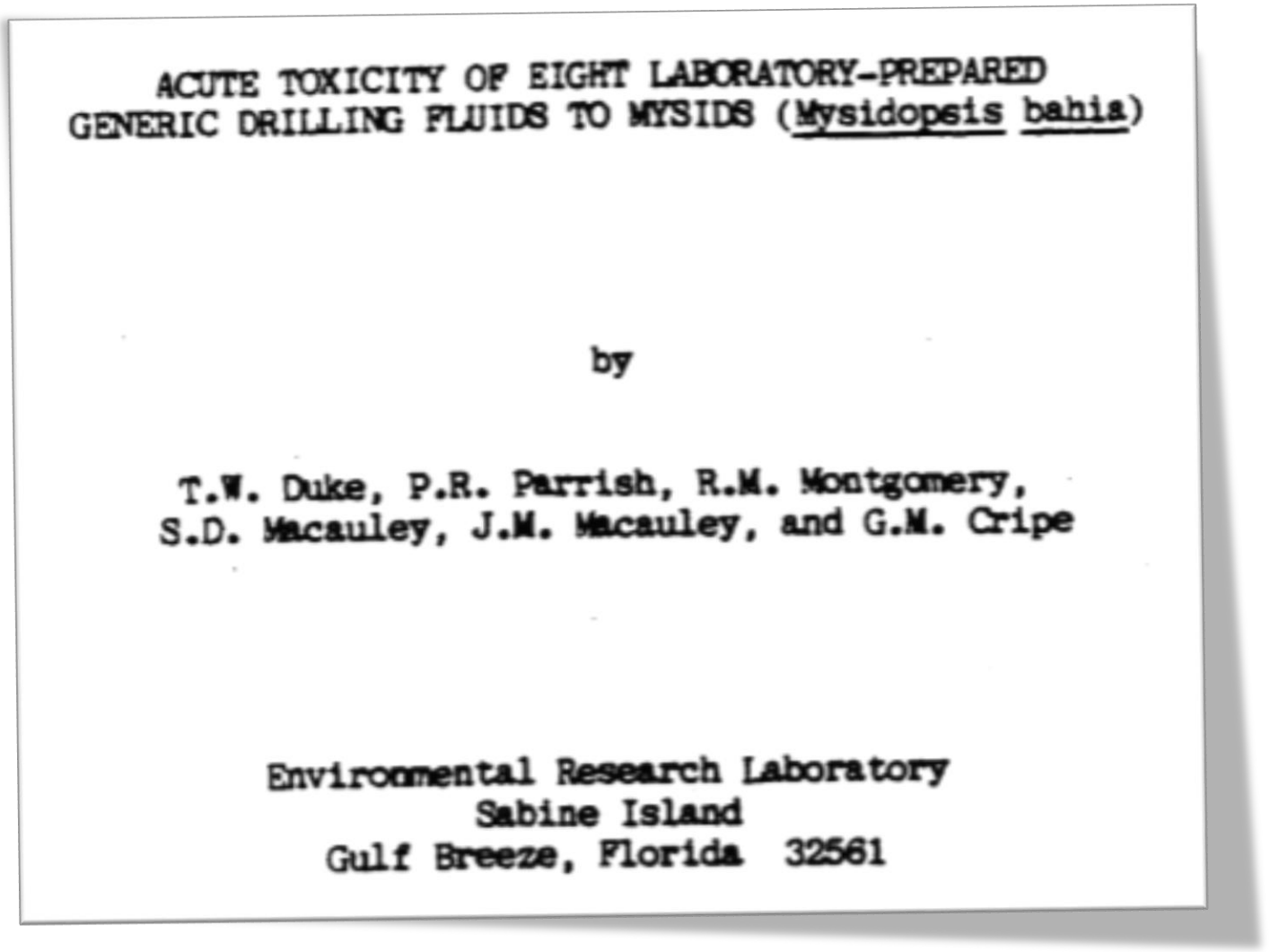
Generic Drilling Fluid

- EPA Research and Development Report
  - “Acute Toxicity of Eight Drilling Fluids to Mysid Shrimp (Mysidopsis bahia)” / EPA-600/3-84-067

Generic Drilling Fluid



ACUTE TOXICITY OF EIGHT LABORATORY-PREPARED
GENERIC DRILLING FLUIDS TO MYSIDS (*Mysidopsis bahia*)

by

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EPA-600/3-84-067

Generic Drilling Fluid

The generic drilling fluid concept was developed jointly by EPA's Region II and industry to provide EPA information on the impact of drilling fluids and components of the fluids released into the environment without requiring each drilling operator to perform repetitious toxicity tests and chemical analyses. The eight generic drilling fluids include virtually all water-based fluids used on the U.S. Outer Continental Shelf. Only major components of the generic fluids are specified and additional information concerning the effects of speciality additives must be submitted to EPA prior to their discharge (Petrazzulo, 1983). The generic fluid concept is now being employed by EPA Regional Offices involved in the permitting process (EPA, 1983).

EPA-600/3-84-067

Generic Drilling Fluid

Drilling Fluid	Source	Composition	
		Component	Concentration
EPA-83-001, KCl Polymer Mud	Chromalloy	KCl	50 0 grams (g)
		Drispac (Super-Lo)	0.5 g
		X-C Polymer	1.0 g
		Barite	283.2 g
		Starch	2.0 g
		Seawater	257 6 milliliters (ml)
EPA-83-002, Seawater Lignosulfonate Mud	IMCO Services	Attapulgite	30.0 pounds per barrel (ppbbl)
		Chrome Lignosulfonate	15.0 ppbbl
		Lignite	10.0 ppbbl
		Polyanionic Cellulose	0.25 ppbbl
		Caustic	To pH 10.5-11.0
		Barite	To bring mud weight to 17-18 pounds per gallon (ppg)
		Seawater	As needed
EPA-83-003, Lime Mud	Hughes	Bentonite	20.06 g
		Lime	5.01 g
		Barite	281.81 g
		Chrome Lignosulfonate	15.04 g
		Caustic	1.00 g
		Lignite	8.02 g
		Distilled water	257.04 ml
EPA-83-004, Non-dispersed mud	Newpark Drilling Fluids	Bentonite	13.0 ppbbl
		Acrylic Polymer (for suspension)	0.5 ppbbl
		Acrylic Polymer (for fluid loss control)	0.25 ppbbl
		Barite	190.7 ppbbl
		Deionized Water	299.6 ppbbl

EPA-600/3-84-067 Project Summary

Generic Drilling Fluid

EPA-83-005, Spud mud	NL Baroid	Bentonite	12.5 ppbbl
		Lime	0.5 ppbbl
		Barite	50.0 ppbbl
		Seawater/Freshwater	1.0 bbl
		Caustic	To pH 10.0
EPA-83-006, Seawater/Freshwater Gel Mud	Milchem	Bentonite	20.0 ppbbl
		Polyanionic Cellulose	0.50 ppbbl
		Sodium Carboxymethyl Cellulose	0.25 ppbbl
		Barite	20.0 ppbbl
		Sodium Hydroxide	To pH 9.5
		Seawater/Freshwater, 1:1	As needed
EPA-83-007, Lightly Treated Lignosulfonate Mud	Magobar Dresser	Bentonite	20.0 ppbbl
		Chrome Lignosulfonate	5.0 ppbbl
		Lignite	3.0 ppbbl
		Soda Ash	1.0 ppbbl
		Carboxymethyl Cellulose	0.5 ppbbl
		Barite	178.5 ppbbl
EPA-83-008, Freshwater Lignosulfonate Mud	Dowell	Bentonite	15.0 g
		Chrome Lignosulfonate	15.0 g
		Lignite	10.0 g
		Carboxymethyl Cellulose	0.25 g
		Sodium Bicarbonate	1.0 g
		Barite	487.0 g
		Deionized Water	187.0 ml

EPA-600/3-84-067 Project Summary

Generic Drilling Fluid

- Technology limit
- Product development
- US Offshore / World Bank

- Thousands of tests
  - *Mysidopsis bahia*
- Comparison testing
- Consistency and accuracy

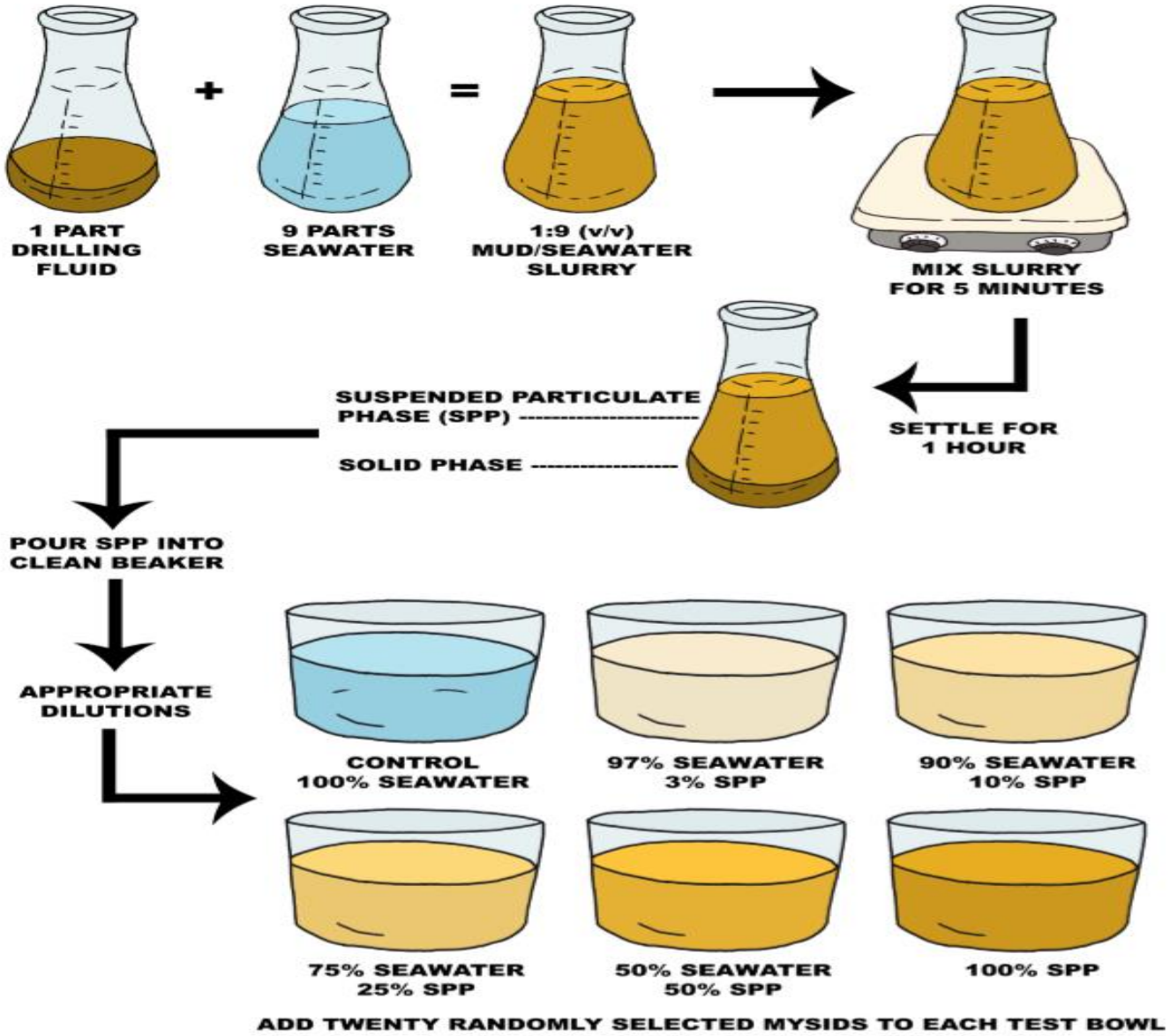
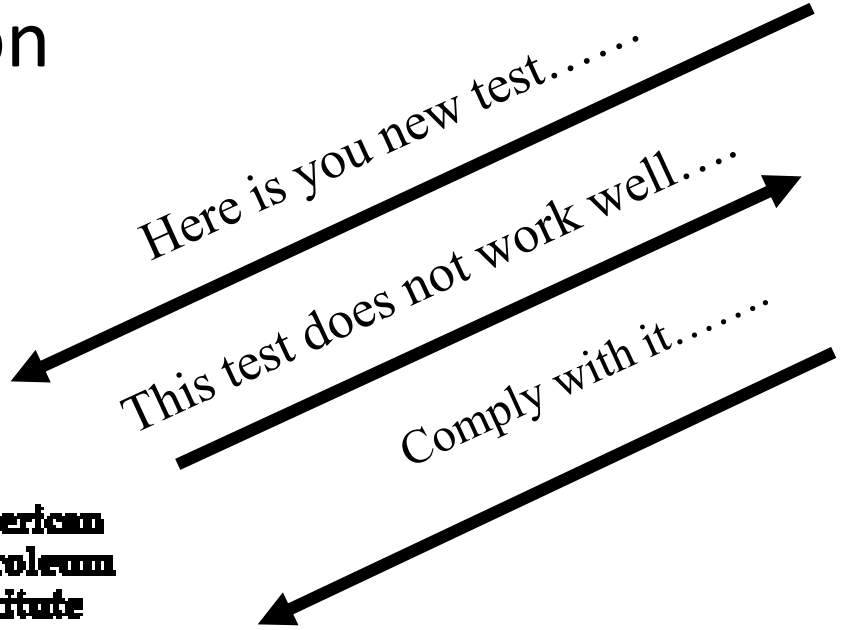


Illustration by P. Tyczynski

Reference Drilling Fluid

- OLD Regulatory Development Process for Test Development and Selection



Reference Drilling Fluid

- NEW Regulatory Development Process for Test Development and Selection

You must develop a new test……

This is the new test we developed….

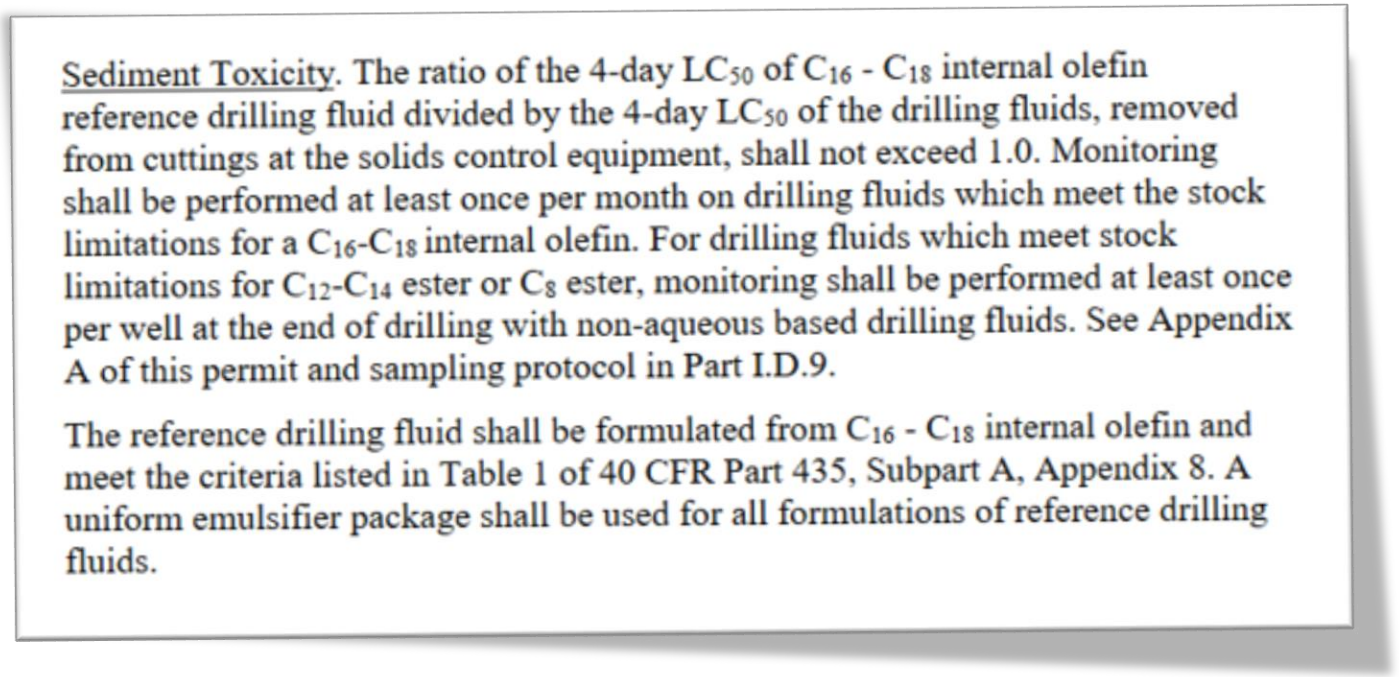
OK, comply with it…….

ean Association

American Petroleum Institute

Reference Drilling Fluid

- SBM Workgroup
  - Lessons learned helped develop the reference drilling fluid and the toxicity test
  - Focus on variability
  - Set technology limit



Sediment Toxicity. The ratio of the 4-day LC_{50} of C_{16} - C_{18} internal olefin reference drilling fluid divided by the 4-day LC_{50} of the drilling fluids, removed from cuttings at the solids control equipment, shall not exceed 1.0. Monitoring shall be performed at least once per month on drilling fluids which meet the stock limitations for a C_{16}-C_{18} internal olefin. For drilling fluids which meet stock limitations for C_{12}-C_{14} ester or C_8 ester, monitoring shall be performed at least once per well at the end of drilling with non-aqueous based drilling fluids. See Appendix A of this permit and sampling protocol in Part I.D.9.

The reference drilling fluid shall be formulated from C_{16} - C_{18} internal olefin and meet the criteria listed in Table 1 of 40 CFR Part 435, Subpart A, Appendix 8. A uniform emulsifier package shall be used for all formulations of reference drilling fluids.

GMG290000

Reference Drilling Fluid

- Sediment toxicity
- Numeric pass fail not an option
- Toxicity ratio reference mud developed as the solution

- *Leptocheirus plumulosus*

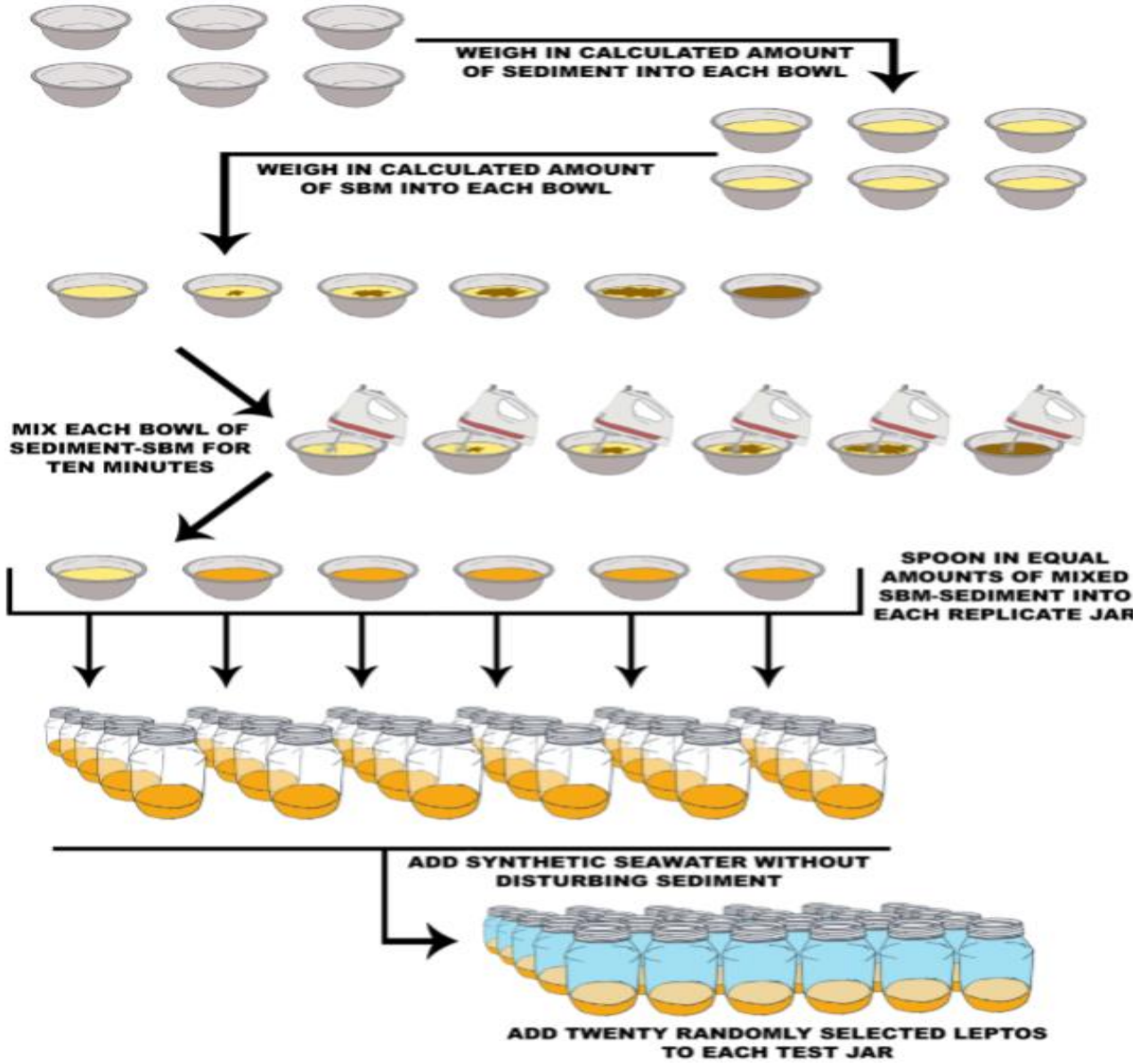


Illustration by P. Tyczynski

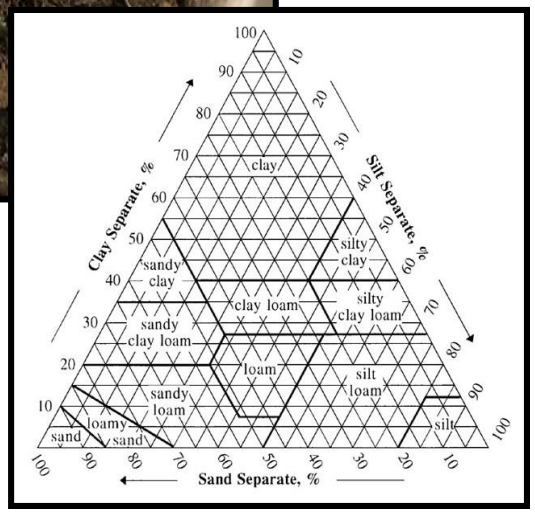
Onshore Options

Offshore

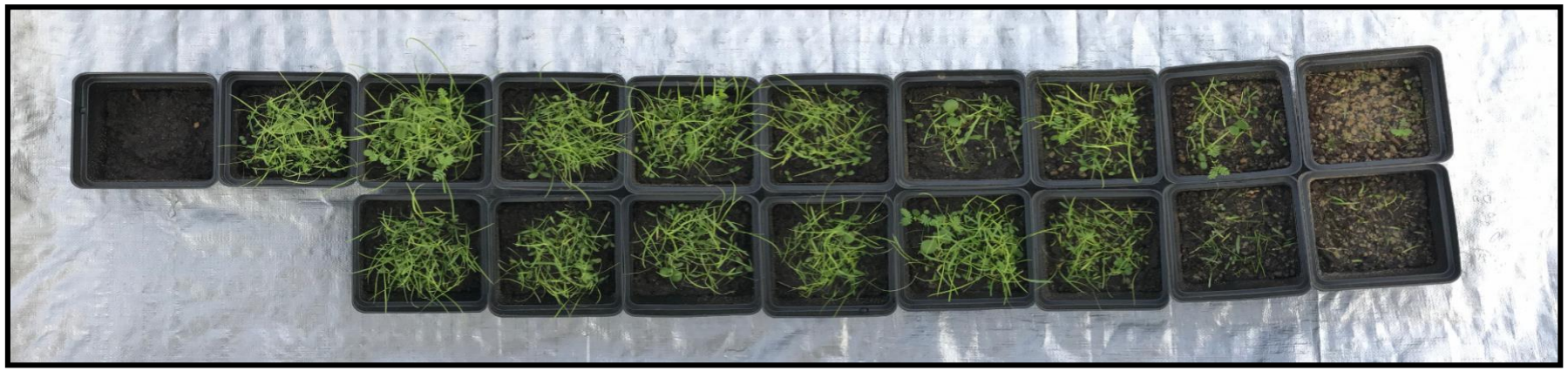
Onshore

Onshore Options

- Generic Onshore Reference Drilling Fluid
- Factors
  - Drilling Fluid
  - Chlorides
  - Electrical Conductivity
  - Soil Science



USDA.gov



Onshore Options

- Drilling fluid technology
  - WBM, OBM, SBM
  - Onsite disposal options

- Similar concepts to build on
- Opportunities for coordinated effort
  - Industry workgroups
  - Organizations: PESA, IPEC, SPE, etc

Onshore Targets and Path Forward

Maximum Discriminatory Power

Practicality of Implementation

Repeatability

Ecological Relevance

Ranking of Known Substances in Order of Environmental Impacts

Onshore Targets and Path Forward

- **Develop options**
  - Drilling fluid and testing
- **Industry workgroups**
  - Evaluate the options that meet the target
- **Consistent evaluation**
  - Use the tools to evaluate the technologies as has been done offshore

Global Approach

Onshore Targets and Path Forward

- **Generic Drilling Fluids Under Development**
  - OBM
  - SBM
  - WBM

- **Test Methods Under Development**
  - Biological Tests – Worms, Fish, Plants
  - Chemical Tests – Soil Quality, EC, SAR, Heavy Metals, TPH

Onshore Targets and Path Forward

Environmental advances are achieved through research, regulatory development, product testing and environmental management programs designed to support regulatory compliance