

Lead-Free Fishing Sinkers Summary



New Environmental Technology for Small Business (NETSB) Project Summary

NETSB, a program developed by the Iowa Waste Reduction Center (IWRC) at the University of Northern Iowa, strives to increase the use of new environmental pollution prevention technology by small business, resulting in measurable environmental and economic benefits.

When choosing which technologies to test, the IWRC recognized three key areas of consideration: environmental criteria, economic measures and small business use feasibility. The equipment should have a positive impact on the environment, such as pollution prevention or energy savings. The technology should be evaluated considering capital costs, operational costs and return on investment. And finally, the equipment should be applicable in a small business environment.

In 2006-2007, the IWRC placed several types of potential pollution prevention technologies at small businesses throughout Iowa including: soy-based metal working fluids, RASERS heat reclamation equipment, lead-free fishing sinkers and Green Earth® dry-cleaning solvent alternative.

Small Business Placement Description

NETSB at the IWRC in partnership with staff from the Material Innovation Service at the University of Northern Iowa worked with a small mold manufacturing company to find an alternative to lead fishing sinkers. The manufactured molds are sold directly to consumer fishing enthusiasts who then create sinkers themselves usually using lead, without any environmental controls. The sinker molds currently manufactured only handle the traditional lead/tin mixture.

The facility was interested in investigating a lead-free alternative for the sinkers so fishing enthusiasts will have a healthier and more environmentally friendly option when making sinkers. Several trials were conducted using different metal combinations until a lead-free formulation with minimal process changes was determined.

Technology Description

Nearly 2,500 metric tons of lead is used per year in the United States to produce fishing sinkers. It's estimated that anglers lose nearly 500 tons of lead fishing sinkers to freshwater lakes and rivers every year.¹

In this NETSB project, IWRC staff, in conjunction with staff from the Material Innovation Service at the University of Northern Iowa, tested several metal combinations to find a suitable lead-free alternative for the fishing sinkers made using molds manufactured by the test facility.

The following eight metal combinations were tested in addition to hard lead as a control:

- Pewter (McMaster Car);
- Tin (Brand B);
- Pennies (92% zinc, 8% copper);
- Pewter (Johnson Mfg. Item #550);
- 90% tin, 10% bismuth;
- 95% tin, 5% bismuth;
- 85% tin, 15% bismuth;
- 90% Tin (Brand B), 10% bismuth.

Environmental Background

Many fishing sinkers are lost during use. When ingested, lead sinkers cause lethal lead poisoning to many aquatic fowl. Species of special concern are shallow feeding birds such as diving and surface feeding ducks, loons, wading birds (herons, cranes, egrets) and shoreline feeders like geese. Lead-poisoned birds may lose their ability to walk and fly and eventually die.² Lead poisoning accounts for 20-30% of adult loon mortality in areas where recreational angling is prevalent.¹

A number of states have placed limits on the use of lead fishing sinkers weighing less than 1 ounce.³

Health Background

Many anglers produce their own lead sinkers at home, an activity that can expose individuals and family members to airborne lead particles or vapors. When melted, lead develops small particles that can easily spread throughout the house. These

particles can stick to everything from dust and furniture to the walls and even stuffed animals.

Children are most susceptible to the harmful effects of lead. Lead dust that settles on the floor or on small objects is transferred to hands and then into the mouth and the body.



Lead can cause brain and nerve damage, delayed growth in children, and reproductive problems and high blood pressure in adults.⁴

Outcomes

POLLUTANT REDUCTION OUTCOMES

Table 1 (on the following page) summarizes the testing of eight metal combinations and the results. The facility also performed a control test using hard lead.

After the eight tests, it was determined the best combination was 90% tin, 10% bismuth, heated to 700° F. These parameters were suggested to the testing facility.

TECHNOLOGY ACCEPTANCE AND USE OUTCOMES

The facility was satisfied with the study results. They are pleased to be able to offer criteria for making lead-free fishing sinkers to their clients.

Metal(s)	Molds	Temp	Results
Pewter (McMaster Carr)	Ultra Minnow Jig - 2, 3, 4-oz.	500°F 600°F	Too cool to fill cavity. Filled larger cavities with laminations did not fill smaller cavities.
	Poison Tail Jig - 1/8, 1/4, 3/8	700°F	Filled cavities with laminations.
Tin (Brand B)	Ultra Minnow Jig - 2, 3, 4-oz. Poison Tail Jig - 1/8, 1/4, 3/8	600°F	Poured well, lightweight.
Pennies 92% zinc, 8% copper	Ultra Minnow Jig - 2, 3, 4-oz.	700°F	Too cool to fill cavity.
	Poison Tail Jig - 1/8, 1/4, 3/8	1000°F	Poor fluidity, too much slag, adhered to pouring equipment.
Pewter (Johnson Mfg. #550)	Roundhead Jig - Assorted sizes	700°F	Too cool to fill cavity.
	Weedless Football - Assorted sizes	1000°F	Poor fluidity, too much slag, adhered to pouring equipment.
90% tin, 10% bismuth	Roundhead Jig - Assorted sizes	300°F	Poured well, difficulty breaking sprue.
	Weedless Football - Assorted sizes		
95% tin, 5% bismuth	Roundhead Jig - Assorted sizes	700°F	Poured well, difficulty breaking sprue.
	Weedless Football - Assorted sizes		
85% tin, 15% bismuth	Roundhead Jig - Assorted sizes	700°F	Very brittle, swells in mold, difficult to release.
	Weedless Football - Assorted sizes		
90% tin, 10% bismuth	Roundhead Jig - Assorted sizes	700°F	Poured well, released well, sprue broke with moderate force.
	Weedless Football - Assorted sizes		

Table 1: Metal Testing Combinations and Results for Lead-Free Fishing Sinker

ACRONYMS USED IN THE CASE STUDY

EPAEnvironmental Protection Agency

IWRCIowa Waste Reduction Center

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References

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- ² “Lead Fishing, Sinkers and Animals.” United States Environmental Protection Agency, Anglers and Aquatic Resources Protection.
<http://www.epa.gov/owow/fish/animals.html>.
- ³ “Lead in Fishing Tackle.” American Sportfishing Association, Government Affairs.
http://www.asafishing.org/asa/government/lead_in_tackle.html.
- ⁴ “Humans and Lead Fishing Sinkers.” United States Environmental Protection Agency, Anglers and Aquatic Resources Protection.
<http://www.epa.gov/owow/tr1/fish/humans.html>.