



Material Substitution Workshop

Safer Products That Work:

Cleaners and Degreasers for Industrial Maintenance and Auto Repair
State/Community Hazardous Material Source Reduction



UNIVERSITY OF MINNESOTA

Driven to DiscoverSM

May 4, 2017



UNIVERSITY OF MINNESOTA

Improving Minnesota's Air Quality

- Collaborative effort launched to develop and implement strategies to improve MN air quality
- MnTAP work to improve Minnesota's air quality by reducing VOCs through material substitution in area source facilities
- Discuss strategies developed to
 - Determine a target sector focus area
 - Establish what are safer products
 - Assure safer products are functionally equivalent
 - Motivate broad adoption of safer products
 - Leverage implementation resources





VOC Opportunity Identification

National Emissions Inventory (NEI) as a tool

Karl DeWahl

VOC Area Sources

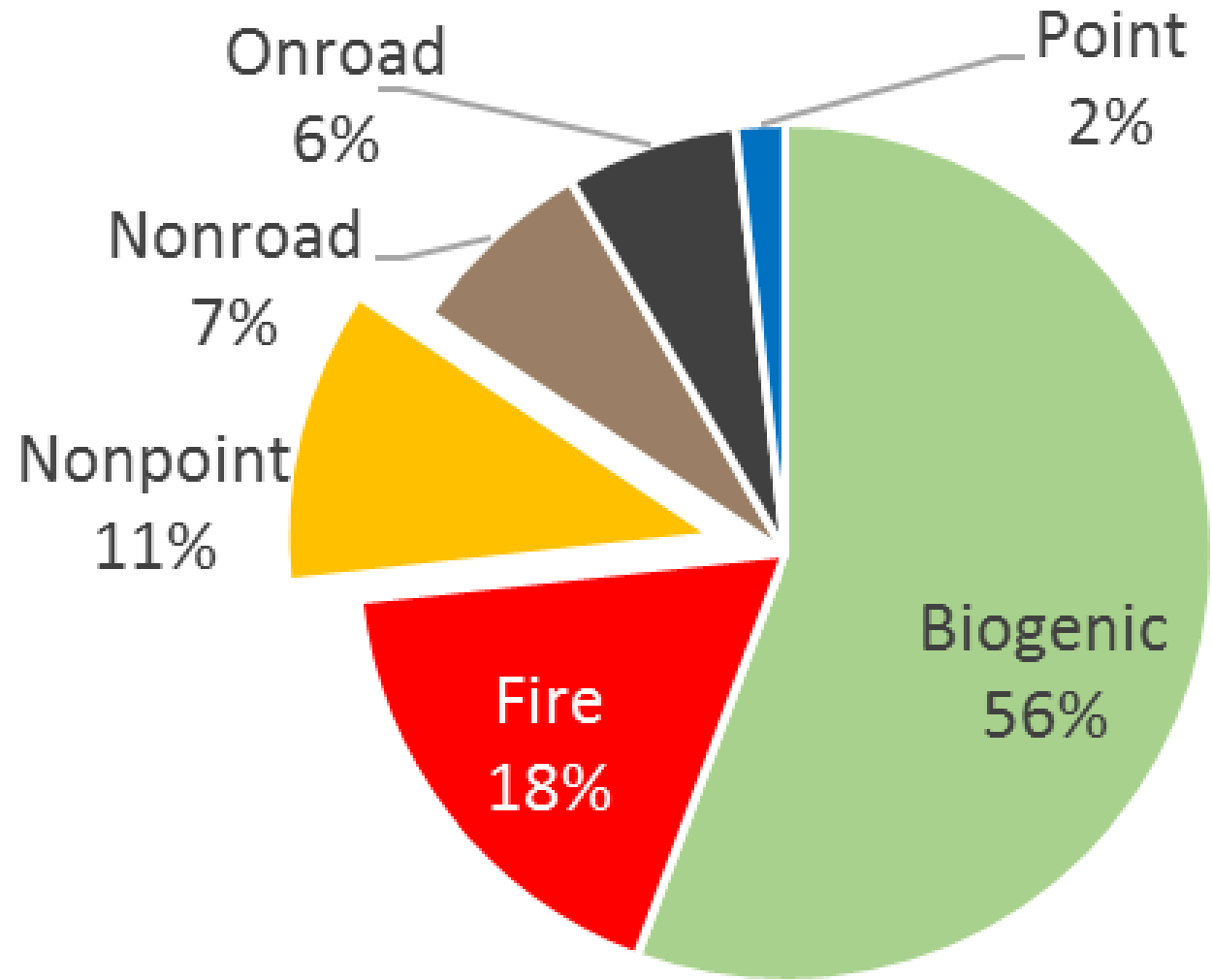
- **2015 EPA NAAQS review**
- **Clean Air Minnesota**
- **Area source focus – MnTAP, MPCA, Minneapolis, EI**
 - **which one(s)?**

National Emissions Inventory (NEI)

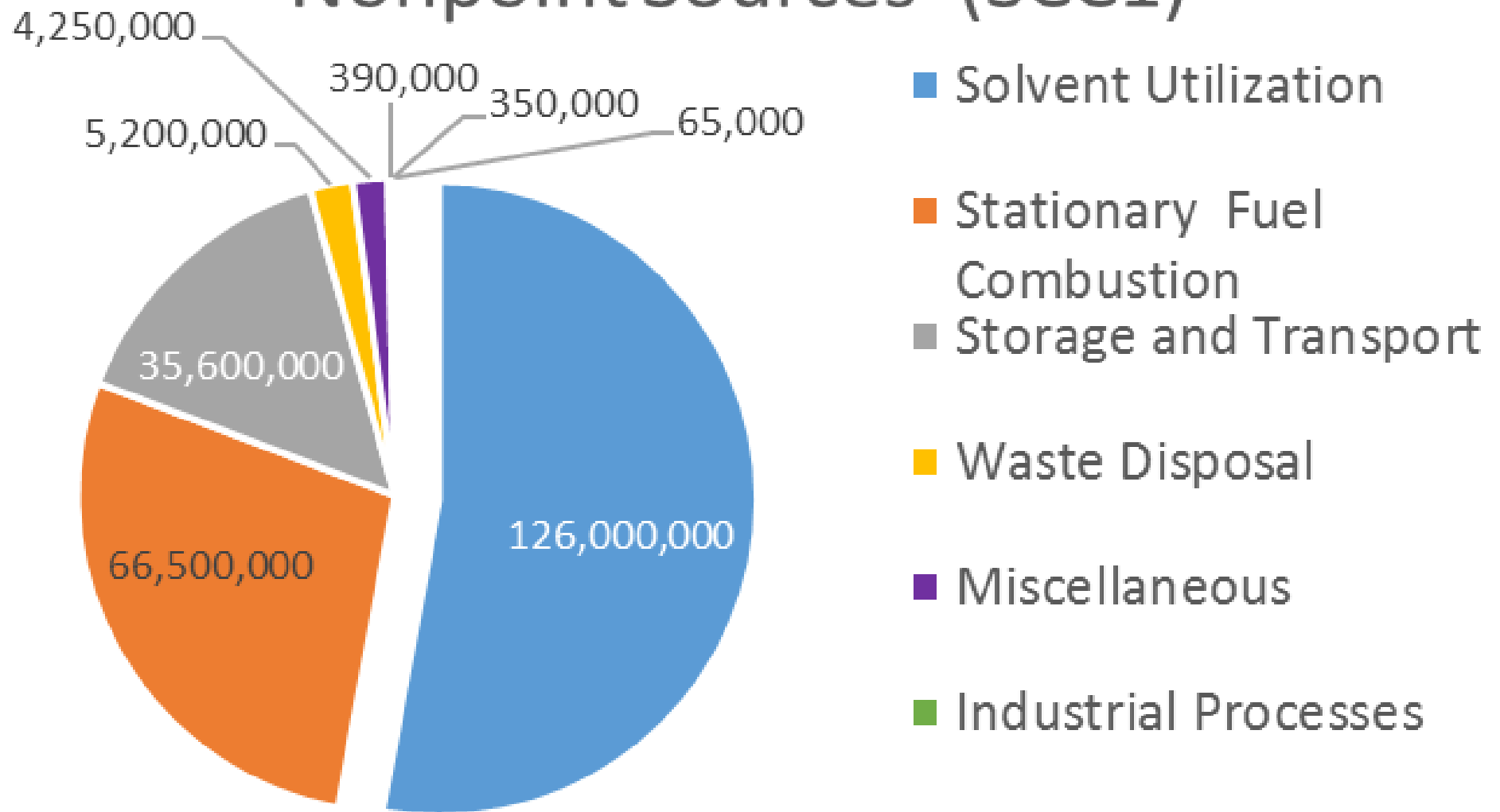
- 2008, 2011, 2014
- Get data from your state
- Criteria pollutants (VOC, CO, SO₂, NO_x, PM, Pb)
 - Point air toxics
 - Some speciation
- Source Classification Codes (SCC)



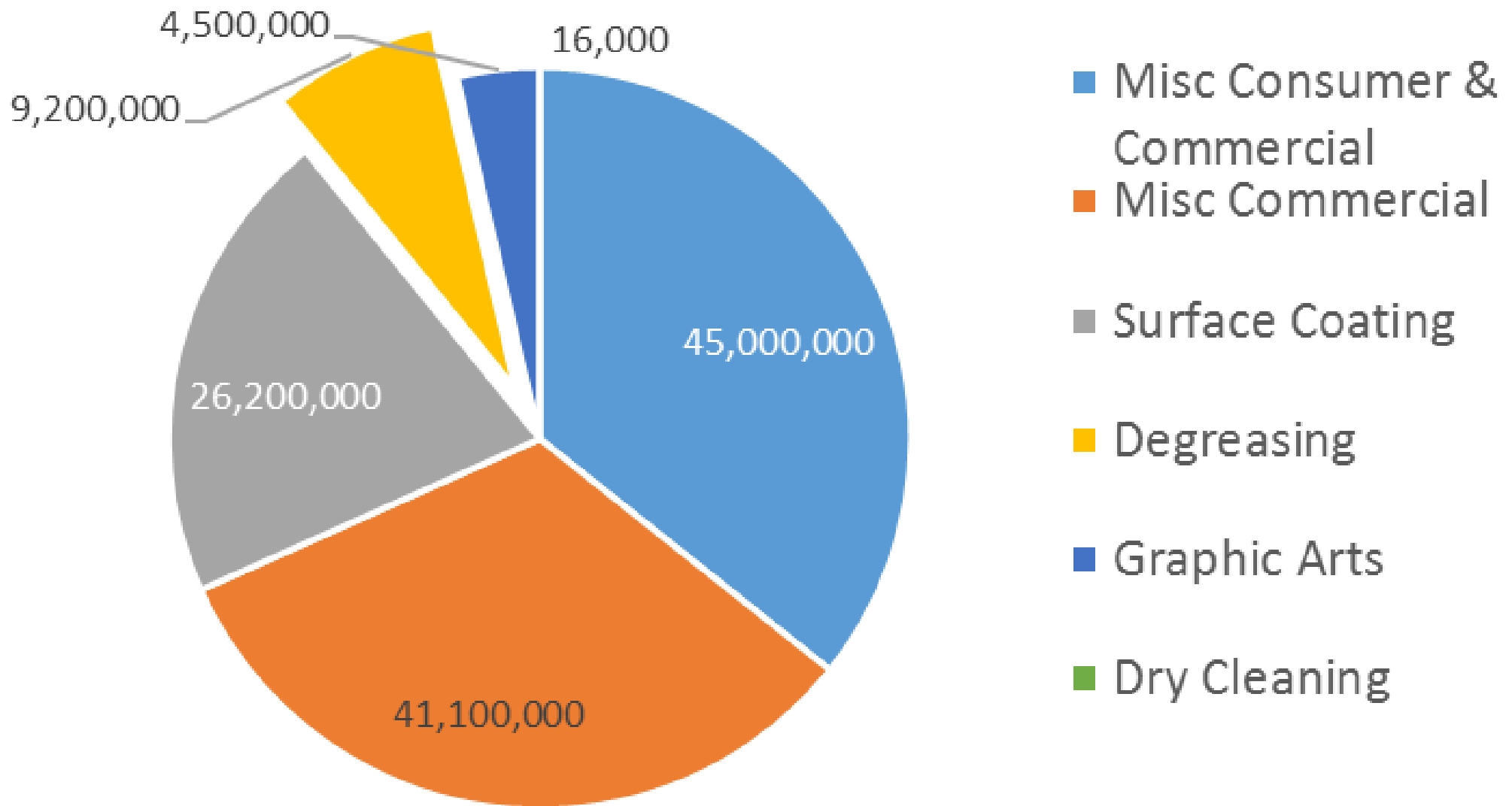
MN VOC Sources



Nonpoint Sources (SCC1)



Nonpoint Solvent Utilization (SCC2)



VOC Sources worked on

- **Degreasing - nonpoint**
 - Vehicle maintenance
 - Industrial maintenance
- **Other TA focus areas**
 - Autobody painting - nonpoint
 - Industrial painting - point
 - FRP - point
 - Oilseed - point

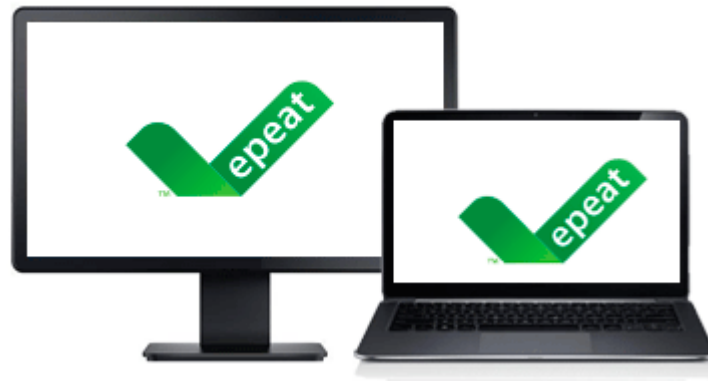


Risk Assessment of Degreasing Products

By Michelle Gage

How do I find safer products?

- TURI – Check out their [Cleaner Solutions Database](#)
- Look for reputable labels:
 - EPA's [Safer Choice](#) Label
 - Green Electronics Council - [EPEAT](#)
 - USDA Organics



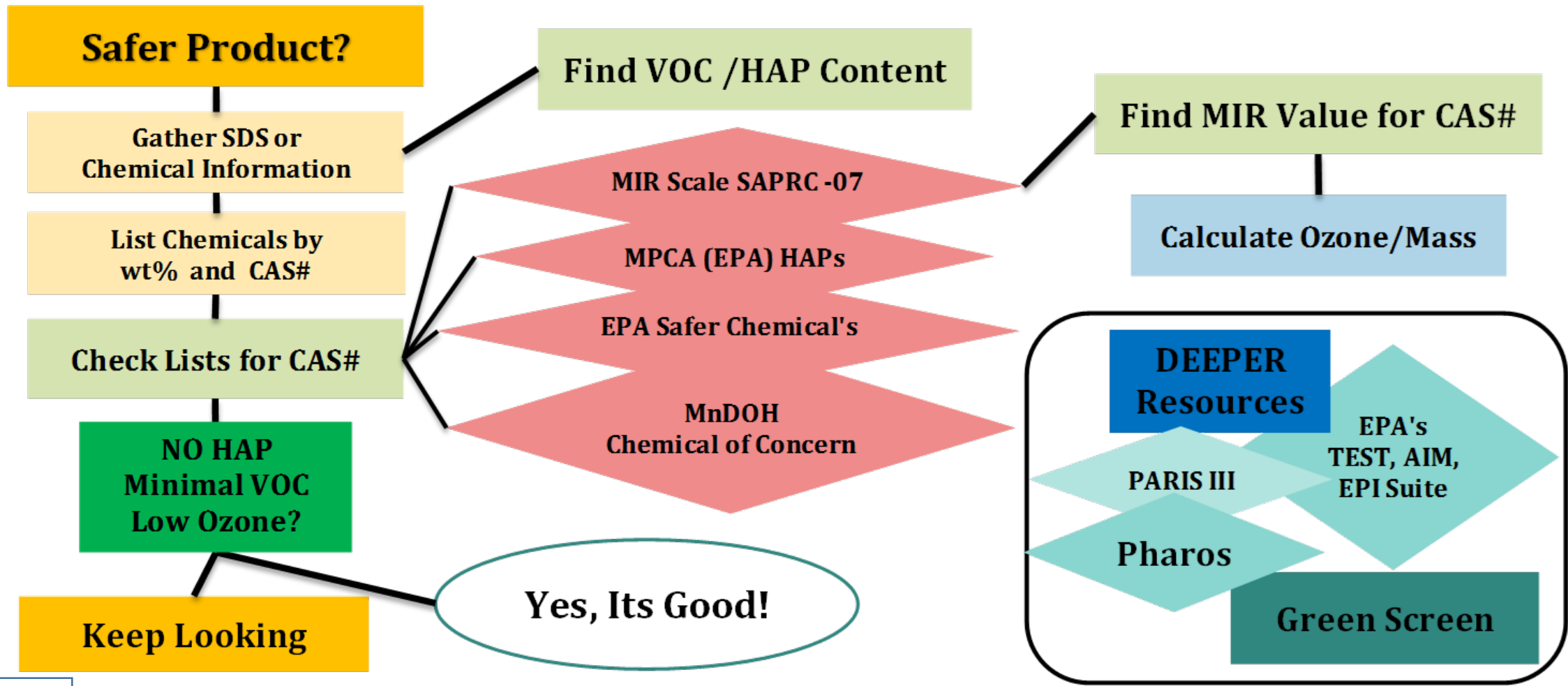
What is “better”?

- Does the product work?
- No Hazardous Air Pollutants (HAP's)
- Low Volatile Organic Compounds (VOC's)
- Low Ozone Generator (lbs.O₃/lbs.product)
- Minimize MN Chemicals of Concern
- Do a comparison!



Choosing "Safer" Products

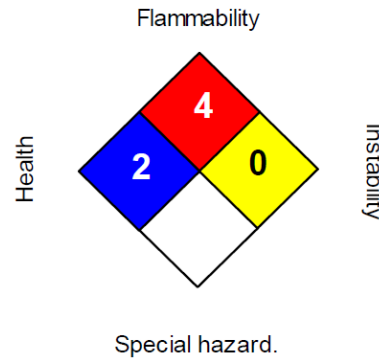
"Safer" is defined by: No HAP, Low VOC, Low Ozone Generator, Minimize Chemicals of Concern



Product Comparison – SDS Information

• Product A

- VOC Content: 100%
- HAP Content: 34.72%

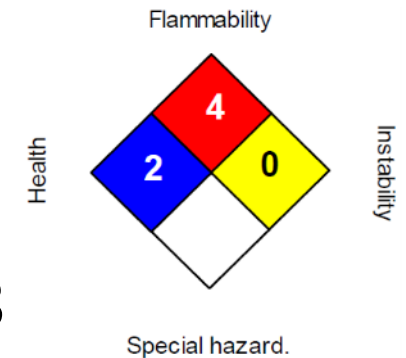


• Section 2: Ingredients

Hydrotreated Light Naphtha	64742-49-0	30-60%
Xylene	1330-20-7	10-30%
Propane	74-98-6	10-30%
Methyl Alcohol	67-56-1	7-13%
Ethylbenzene	100-41-4	2-8%
Toluene	108-88-3	<0.1%

• Product B

- VOC Content: ???
- Specific Gravity: 0.728



• Section 2: Ingredients

Acetone	67-64-1	50-70%
Heptane-branched, cyclic and linear	426260-76-6	30-50%
Heptane	142-82-5	1-5%
Carbon Dioxide	124-38-9	5-10%

Product Comparison - Examine Ingredients

• Product A

Ingredient	CAS #	Wt %	MIR Value	Overall MIR	Lists
Hydrotreated Light Naphtha	64742-49-0	48.28%	1.4**	2.6	
Xylene	1330-20-7	21%	7.76		HAP, MnCOC-Respiratory
Propane	74-98-6	17%	0.49		
Methyl Alcohol	67-56-1	9%	0.67		HAP, MnCOC-Development
Ethylbenzene	100-41-4	4.62%	3.04		HAP, MnCOC-Cancer, Development
Toluene	108-88-3	<0.1%	4.0		HAP, MnCOC-Multiple

**mixed isomers, alkanes, iso-alkanes, BP: 40-60C (104-140F)

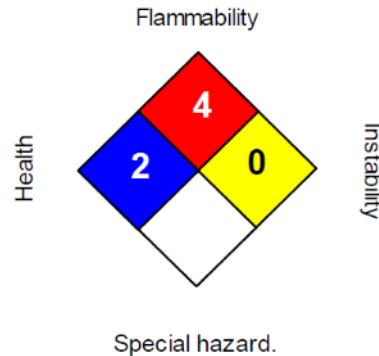
• Product B

Ingredient	CAS #	Wt %	MIR Value	Overall MIR	Lists
Acetone	67-64-1	52%	0.36	0.83	VOC Exempt
Heptane-branched, cyclic and linear	426260-76-6	40%	1.47		
Heptane	142-82-5	5%	1.07		
Carbon Dioxide	64742-52-5	3%	0		

Product Comparison – Summarize

- **Product A**

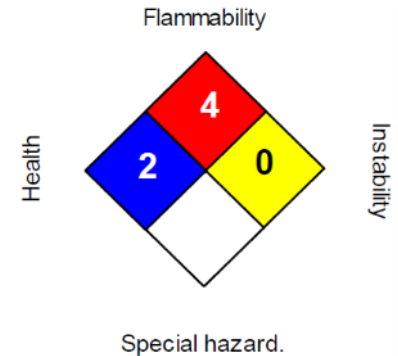
- **VOC Content: 100%**
- **HAP Content: 34.72%**



- **MIR Value: 2.6 lbs O₃/lb**
- **Ingredients on HAP, MnCOC lists**

- **Product B**

- **VOC Content: 45%**
- **HAP Content: 0%**



- **MIR Value: 0.83 lbs O₃/lb**
- **Ingredients on VOC Exempt**

Which products were they?

A: 3M High Power
Brake Cleaner #08880



B: Parts Master Low-VOC
Brake Cleaner #0732





Consumer Confusion

• **Penray Non-Chlorinated Brake Cleaner - 4620**

- Xylene 7-13%
- Toluene 1-5%
- Acetone 30-60%
- Heptane 25-70%
- Carbon Dioxide 3-7%

• **CRC Brakleen 05089**

- Perchloroethylene 90-100%
- Carbon Dioxide 1-5%

• **Gunk M720**

- Perchloroethylene 40-50%
- Dichloromethane 40-50%
- Carbon Dioxide 1-5%

• **Valvoline 6861046**

- Acetone 86.21%
- Xylene 5.12%
- Methanol 2.79%
- Ethyl Benzene 1.53%
- Carbon Dioxide 5.86%

Consumer Confusion



- **O'Reilly Non-Chlorinated Brake Cleaner – 72408**

- Toluene 30-40%
- Methanol 30-40%
- Acetone 20-30%
- Carbon Dioxide 5-15%

- **O'Reilly Low VOC Brake Cleaner - 00482**

- Heptane 50-55%
- Toluene 20-25%
- Acetone 15-20%
- Carbon Dioxide 0-15%

- **O'Reilly Ultra Low VOC Brake Cleaner - 46580**

- Acetone 80-85%
- Heptane 5-10%
- Carbon Dioxide 0-15%

Some Best Practices:

- Look for Safer Product labels, or get reputable recommendation
- “California or 50-State Compliant” Products typically have safest ingredients
- “Non-Chlorinated” and “Low VOC” might be good, but do not guarantee the safest ingredients
- Look at SDS and
 - **Avoid: Xylene, methanol, toluene, ethylbenzene, naphthalene, chlorinated**
- **Avoid citrus cleaners**
 - d-limonene is a VOC, MIR = 4.55, acute aquatic toxicity

Pilot Projects: Product Trials, Results and Key Findings

Matt Domski, Jon Vanyo, Jane Paulson

Round 1: Auto repair and industrial maintenance pilot projects



- Outreach to MN auto repair and industrial maintenance facilities
- Engaged to assess current use of cleaning and degreasing chemicals
- Trials of alternative products conducted in attempt to displace or replace the more harmful products in use

EPA SRA Grant Project X9-00E01322-0

Format of Round 1 Pilot Projects

- Assess product use at Industrial/Automotive businesses
- Finding greener, safer products
- Industrial and Automotive businesses eligible
- Looking for products with
 - Few Volatile Organic Compounds
 - Zero Hazardous Air Pollutants
 - Zero Minnesota Chemicals of Concern
- Company trialed grant purchased sample of new product
- MnTAP provided hands-on technical support



Demonstrating and Trialing Products

- Finding potential replacements comes first, but they have to work for the process we are dropping them in to!





Section Cleaned
with Tuff Green
1:7 Concentrate
to Water Ratio

Section Cleaned
with Orange
Cleaner 1:1 Product
to Water Ratio

Section Cleaned
with Soy Response
at 1:0 Product to
Water Ratio

H2

Demonstrating and Trialing Products

- **With trials, observe how the trial product compares to the current product**
 - Time it takes to do the job
 - Does it leave any unwanted residue?
 - Can you use the same method? (does the same rag work, do you need more force to clean, etc)
 - Overall, can you achieve the results required for the job



Case study video – if time

- Lakeland Tool & Engineering, Inc.
- https://www.youtube.com/watch?v=Z8z2L_9jxHo&index=3&list=PLmkkLyNNuwqRupgEUxJQpAOUGeMSeeUjf

Outcomes

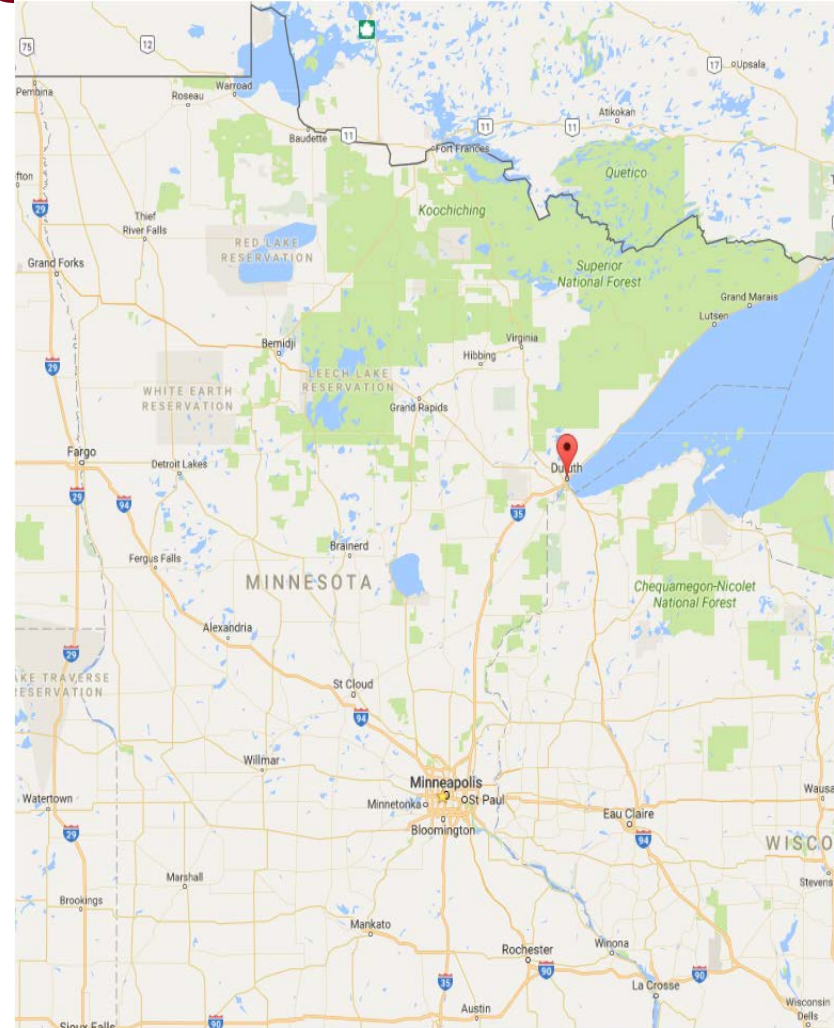
- 57 referrals received from HW inspectors and partners
- 39 facilities engaged/informed of safer products
- 23 facilities conducted trials
- 12 facilities implemented change
- 7 others using good products

Status	Suggestions	Lb VOC Red/yr	Lb HAP Red/yr	Lb SW Red/yr	Annual Savings
Suggested	59	23,760	5,880	4,400	\$13,060
Implemented	26	3,030	760	650	\$7,470

Round 2: Duluth Degreasing Blitz

- Air Quality Project for Duluth, Minnesota.
- [EPA “Making a Visible Difference in Communities”](#)
- Areas are overburdened, underserved, and economically distressed.

EPA CEP Grant Project X9-00E02031



Vendors and Samples

- Two days to visit 50 shops
- Michelle got buy-in from local vendors and put together a product list and organized samples and vouchers.
- Advanced Auto Parts
- O'Reilly
- Auto Value

FREE PRODUCT VOUCHER

CLEANER AIR FOR DULUTH

MnTAP shop identifier _____
 Auto shop name _____
 Auto shop address _____

 Person redeeming _____
 Redeem through 1/15/2017 at:

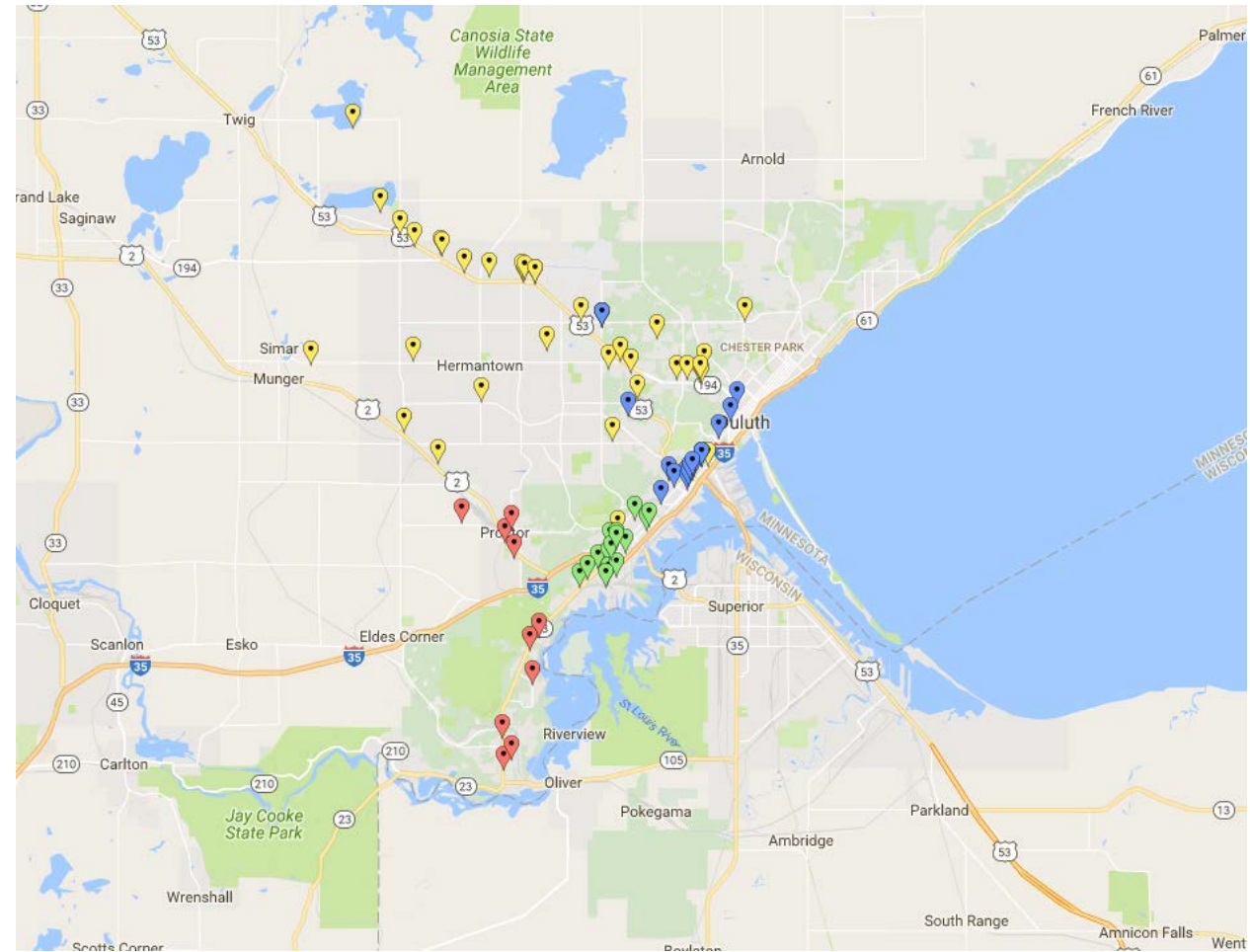
Advance Auto Parts
 5514 Grand Avenue
 Duluth, Minnesota
 218-624-1830

	Good for one case (12 cans)	Part Number	VOC Content	HAP Content
Check ONE	Wearever Brake Parts Cleaner	W7340	80%	0%
	Wearever Low-VOC Brake Parts Cleaner	W7341	34%	0%
Currently Using				

Shop name _____
 MnTAP shop identifier _____
 Product part number _____

Project Format

- Matt developed this batch-geo map
- Sites identified using the Mergent Intellect Database.
- Road map for accomplishing the site visits.



Blitz Assessments

- Intro – Doing a University of Minnesota Project on brake cleaners – if you have a minute to talk with me, I can give you a voucher for a free case of brake cleaner.
- Goals are to reduce VOCs, chemicals that contribute to air pollution, and HAPs, chemicals that can have adverse effects on human health.



Advanced Auto Parts

Manufacturer	Name / Product Number	Components	In Store?	VOC%	HAP%
Wearever	Low-VOC #W7341	Acetone / hydrocarbon	No	34.00	0.00
Wearever	W7340	Hydrocarbon / acetone	Yes	80.00	0.00
CRC	Non-Chlorinated #05084	Acetone/Methanol/ Toluene	Yes	43.80	22.40
3M	High Power #08880	Hydrocarbon / Xylene	No	100.00	34.72
CRC	Non-Chlorinated #05088	methanol, toluene, acetone	Yes	84.00	45.00
Valvoline	Heavy Duty #602371	Acetone/ Methanol/ Xylene	Yes	48.00	48.00
Wearever	Chlorinated BPC W5089	Perc	Yes	0.00	95.00
CRC	Non-Flammable #05089	Perc	Yes		97.70

Best → Worst

Auto Value

Manufacturer	Name / Product Number	Components	In Store?	VOC%	HAP%
Parts Master	Brake & Parts Cleaner #0732	Acetone / Heptane	Yes	53.50	0.00
Parts Master	Brake & Parts Cleaner #0734	Heptane / alcohol	Yes	100.00	0.00
3M	High Power Brake Cleaner #08880	Hydrocarbon/xylene	Yes	100	34.72
Perfect Stop	Brake Cleaner #0265	Toluene / Heptane	Yes	94.60	35.80
Parts Master	Brake & Parts Cleaner #1733	PERC	Yes	0.00	92.70
Permatix	Brake Cleaner #82606	PERC,	Yes	29.00	95.00

Best → Worst

Autozone

Manufacturer	Name / Product Number	Components	In Store?	VOC%	HAP%
Gunk	BPC M710	Acetone	No	0.00	0.00
Gunk	BPC M709	Acetone	No	9.00	0.00
CRC	Brakleen 05050	Acetone	No	9.20	0.00
CRC	BPC 05054	Acetone / Heptane	No	20.00	0.00
Auto Zone	Brake Cleaner AZP-10CA	Acetone / Heptane	No	44.36	0.00
Zep	Brake Cleaner ZAA734	Hydrocarbon / ethanol	Yes	95.00	0.00
Lucas Oil	BPC #10906	Acetone / Toluene	No	11.00	6.00
CRC	Brakleen Non-Chlorinated #05084	Acetone / Methanol / Toluene	No	43.8	22.4
Gunk	Brake Parts Cleaner #M715	Acetone / dimethyl benzene / heptane	Yes	44.00	33.00
CRC	Brakleen Non-Chlorinated #05088	methanol, toluene, acetone	Yes	84.00	60.00
Auto Zone	Brake Cleaner AZP-10	Toluene / Heptane	Yes	94.62	71.48
Zep	Brake Cleaner ZAA733B	TCE	Yes	0.00	90.00
Gunk	Brake Parts Cleaner #M720	DCM/ PERC	Yes	0.00	97.00
CRC	Brakleen #05089	Perc	Yes	0.00	97.70

Best ↓

Worst



Blitz Assessments

- Type of brake cleaner -
- Quantity -
- Preferred vendors -
- Sample Product
- Follow Up within a month to learn how the safer product worked.



Advanced Auto Parts

Manufacturer	Name / Product Number	Components	In Store?	VOC%	HAP%
Wearever	Low-VOC #W7341	Acetone / hydrocarbon	No	34.00	0.00
Wearever	W7340	Hydrocarbon / acetone	Yes	80.00	0.00
CRC	Non-Chlorinated #05084	Acetone/Methanol/ Toluene	Yes	43.80	22.40
3M	High Power #08880	Hydrocarbon / Xylene	No	100.00	34.72
CRC	Non-Chlorinated #05088	methanol, toluene, acetone	Yes	84.00	45.00
Valvoline	Heavy Duty #602371	Acetone/ Methanol/ Xylene	Yes	48.00	48.00
Wearever	Chlorinated BPC W5089	Perc	Yes	0.00	95.00
CRC	Non-Flammable #05089	Perc	Yes		97.70

Best → Worst

Auto Value

Manufacturer	Name / Product Number	Components	In Store?	VOC%	HAP%
Parts Master	Brake & Parts Cleaner #0732	Acetone / Heptane	Yes	53.50	0.00
Parts Master	Brake & Parts Cleaner #0734	Heptane / alcohol	Yes	100.00	0.00
3M	High Power Brake Cleaner #08880	Hydrocarbon/xylene	Yes	100	34.72
Perfect Stop	Brake Cleaner #0285	Toluene / Heptane	Yes	94.60	35.80
Parts Master	Brake & Parts Cleaner #1733	PERC	Yes	0.00	92.70
Permatix	Brake Cleaner #82606	PERC,	Yes	29.00	95.00

Best → Worst

Autozone

Manufacturer	Name / Product Number	Components	In Store?	VOC%	HAP%
Gunk	BPC M710	Acetone	No	0.00	0.00
Gunk	BPC M709	Acetone	No	9.00	0.00
CRC	Brakleen 05050	Acetone	No	9.20	0.00
CRC	BPC 05054	Acetone / Heptane	No	20.00	0.00
Auto Zone	Brake Cleaner AZP-10CA	Acetone / Heptane	No	44.36	0.00
Zep	Brake Cleaner ZAA734	Hydrocarbon / ethanol	Yes	95.00	0.00
Lucas Oil	BPC #10906	Acetone / Toluene	No	11.00	6.00
CRC	Brakleen Non-Chlorinated #05084	Acetone / Methanol / Toluene	No	43.8	22.4
Gunk	Brake Parts Cleaner #M715	Acetone / dimethyl benzene / heptane	Yes	44.00	33.00
CRC	Brakleen Non-Chlorinated #05088	methanol, toluene, acetone	Yes	84.00	60.00
Auto Zone	Brake Cleaner AZP-10	Toluene / Heptane	Yes	94.62	71.48
Zep	Brake Cleaner ZAA733B	TCE	Yes	0.00	90.00
Gunk	Brake Parts Cleaner #M720	DCM/ PERC	Yes	0.00	97.00
CRC	Brakleen #05089	Perc	Yes	0.00	97.70

Best ↓

Worst

Duluth Blitz Impacts



- **Follow-up Results**

- 50 Site Visits
- 32 Businesses Sampled Product
- 16 Cases Redeemed
- 10 Sites Implemented
- 2 Sites Pending Implementation

- **Annual Implemented Results**

- 1700 Pounds of VOCs
- 660 Pounds HAPs

Key Learning – Round 1 of degreasing efforts

- Providing trial product critical to participation
- Supplier relationships are important
- Price is a big factor in change
- **Not easy for facilities to choose safer products on their own**
 - Confusion – need part numbers to identify formulation
 - Suppliers may/may not stock safer products
 - Companies do not always have a clear understanding of their current products – they may have multiple products in the same category.
 - Sites may have large stock of product to use up before making a switch
- **One alternative may not work for every job – partial change is still an improvement**

Consumer
Confusion



Bulk Products

• Benefits

- Bulk products are usually much cheaper than aerosol products
- Reduce packaging
- Eliminate propellants, which also may be VOCs

• Obstacles

- Often only available in 55 gallon drums
 - Too much inventory for small businesses
 - Difficult to transport
- May create reporting obligation, hazardous waste generator
- Upgrading from bulk cleaner to the safest bulk cleaners is often a big price increase



Key Learning – Round 2 of degreasing efforts

- **Providing free product on the spot is a helpful draw**
- **Simple messaging is important**
 - Avoid technical jargon
 - Focus on human health risks - especially exposure to HAPs
 - Helpful to explain that sample products have tested positively with other sites
- **Quick visits are good, showing that you understand their time constraints**
- **Follow-up soon after visit (within 1 week recommended)**
- **Pricing and supplier relationships are again big**
 - Shops may have 1 supplier for all products and get a great deal on brake cleaner

New Projects

- **Phillips Community Air Emissions Reduction – *EPA SRA X9-00E02051***
 - Multi-part project including interns and technical assistance by MnTAP staff
 - 2 interns (one 2017 and one 2018) will work on air emissions projects at large facilities in the community.
 - 2 interns will work with small businesses
 - 2017 intern will focus on automotive businesses
 - 2018 planned to focus on janitorial products and multi-family housing
- **North Minneapolis**
 - Pending State grant, early planning stages
 - Plan to work with a variety of businesses

Overall Impact to Date

- 71 businesses engaged
- 22 businesses implemented a change to greener products
- 4700 lbs VOC
- 1400 lbs HAP

City of Minneapolis Green Business Cost Share Program

Patrick Hanlon

Environmental Initiatives Manager

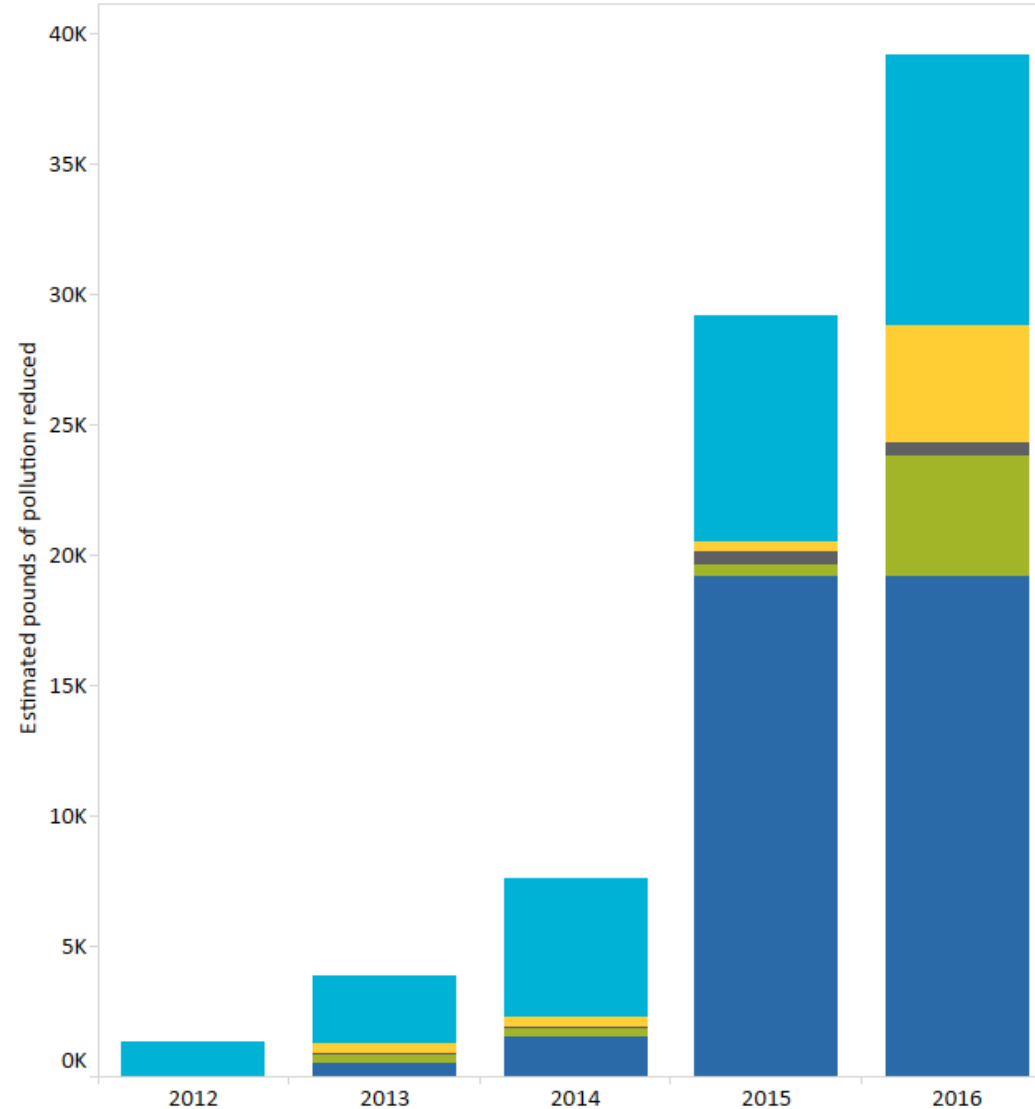
**City of Minneapolis Health
Department**

10 years ago...

Green Business Cost Share Program

- **The City offers Green Business Cost Sharing awards for businesses willing to invest in cleaner, greener, or more efficient technologies.**
- **Several qualifying alternatives include, but are not limited to:**
 - Perc free dry cleaning options (up to \$35,000)
 - Aqueous-based paint booth systems (up to \$25,000)
 - Energy and heating efficiency upgrades (up to \$20,000)
 - Innovative ways to reduce pollution (up to \$100,000)
- **Business practices funding include:**
 - Parts washers, dry cleaning changeouts, waterborne paintbooths, LED print curing, energy efficiency, solar, Green Breweries...electric trollies?

Estimated amount of pollution avoided through the Green Business Cost Share program (2012-2016)



40 businesses have participated in the Green Business Cost Sharing Program

60,000lbs of criteria Pollution reduction
5,000,000 kWh Energy reduction
14,000 therms
3,000,000 gallons of water reduction

Partners

MNTAP (EPA EJ work)
Environmental Initiative
Minnesota Pollution Control Agency
Chamber of Commerce
Lake Street Council
Neighborhood Organizations
Industry Associations (MN Cleaners)
Xcel
CenterPoint

More Details on the Minneapolis Program

<https://www.youtube.com/watch?v=dtPQrwSS7Ck>

Environmental Initiatives

Biochar- Jim Doten

Urban Forestry- Erin Streff

Crowd Sourcing PM- Ahmed Hashi

Air Quality: A Neighborhood Approach- Jen Lansing

Conservation of Minneapolis Bees- Tiana Cervantes

Minneapolis Environmental Education- Markeeta

Tank Removal and Well Sealing Assistance-Tom Frame

Resources

- **Webinar and video case studies**
 - <http://www.mntap.umn.edu/industries/air/degreasing.html>
- **Safer product recommendations**
 - <http://www.mntap.umn.edu/industries/air/Recommended%20Products%20Final.pdf>
- **MnTAP Source Degreasing Issue**
 - <http://www.mntap.umn.edu/source/2016-1/Source2016-1.pdf>



MnTAP's Degreasing Busters

Minnesota Technical Assistance Program

Strengthening Minnesota businesses by improving efficiency while saving money through energy, water, and waste reduction

Thank You!

Laura Babcock	612-624-4678	lbabcock@umn.edu
Karl DeWahl	612-624-4645	dewa001@umn.edu
Michelle Gage	612-624-4619	mcgage@umn.edu
Matt Domski	612-624-5119	domsk004@umn.edu
Jon Vanyo	612-624-4683	jvanyo@umn.edu
Jane Paulson	612-624-1826	janep2@umn.edu