

Chronic Hydrocarbon Releases at Gas Stations

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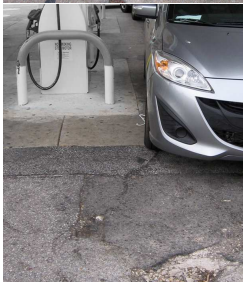
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Health Effects of Gasoline

- 1 Gasoline + $\text{NO}_x \rightarrow \text{O}_3$
EPA: People with lung disease, children, older adults, and people who are active outdoors may be particularly sensitive to ozone
- 2 Benzene, toluene, ethylbenzene, and xylenes (BTEX): toxic or carcinogenic
- 3 Benzene is carcinogenic to humans (IARC)
0.62 %vol

Chronic Liquid Spills



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Infiltration and evaporation of small hydrocarbon spills at gas stations

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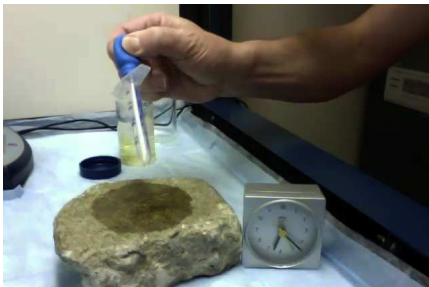


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ABSTRACT

Small gasoline spills frequently occur at gasoline dispensing stations. We have developed a mathematical model to estimate both the amount of gasoline that infiltrates into the concrete



Chronic Vapor Emissions: Stage II Vapor Recovery



FLIR Gas Finder (JimSchrodt)

Vehicle Vapor Recovery
None
ORVR

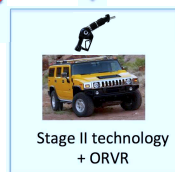
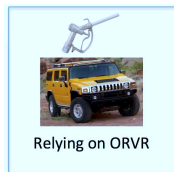
Nozzle Vapor Recovery

None

Stage II



Proposed Action?



- 1 Gasoline vapor emissions can be reduced significantly by adequate Stage II and other pollution prevention technology
- 2 Decommissioning Stage II Vapor Recovery relies on
 - widespread use of ORVR; however, older cars, non-road engines, motorcycles, boats and canisters are not equipped with ORVR
 - 98% efficiency of ORVR which might not apply to older vehicles
- 3 Decommissioning Stage II Vapor Recovery can be expected to have more adverse health effects in metropolitan areas

Upscaling Evaporative Gasoline Losses

**Table 27. Stage II Reductions with Zero IEE
Onroad Plus Nonroad, Displacement Plus Spillage Impacts, Scenario 1
(VOC, metric tonnes per day)**

County	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Anne Arundel	0.73	0.65	0.58	0.52	0.48	0.45	0.43	0.40	0.38	0.37
Baltimore	1.00	0.88	0.78	0.70	0.64	0.59	0.56	0.53	0.50	0.48
Calvert	0.10	0.09	0.08	0.08	0.07	0.06	0.06	0.06	0.05	0.05
Carroll	0.19	0.17	0.15	0.14	0.13	0.12	0.12	0.11	0.11	0.10
Cecil	0.18	0.16	0.15	0.13	0.12	0.11	0.11	0.10	0.10	0.09
Charles	0.17	0.15	0.14	0.13	0.11	0.11	0.10	0.09	0.09	0.09
Frederick	0.39	0.35	0.31	0.28	0.26	0.24	0.22	0.21	0.20	0.20
Harford	0.30	0.26	0.24	0.21	0.20	0.19	0.18	0.17	0.16	0.15
Howard	0.49	0.43	0.39	0.35	0.32	0.30	0.28	0.27	0.26	0.25
Montgomery	1.10	0.99	0.89	0.81	0.75	0.69	0.65	0.62	0.60	0.59
Prince George's	1.12	0.98	0.87	0.77	0.69	0.63	0.58	0.54	0.52	0.50
Baltimore City	0.43	0.38	0.33	0.30	0.27	0.25	0.23	0.22	0.21	0.20
Baltimore Region Total	3.14	2.76	2.47	2.23	2.03	1.89	1.80	1.70	1.62	1.56
Washington Region Total	2.90	2.56	2.29	2.07	1.88	1.72	1.61	1.53	1.46	1.42
Stage II Area Total	6.21	5.49	4.91	4.43	4.04	3.73	3.52	3.32	3.18	3.07

Research Needs

- **Econometric modeling** of emissions from gasoline dispensing operations including the benefit of pollution prevention technology, and **public health and energy saving benefits**
- **Risk analyses** to assess the exposures to harmful gasoline vapors among **customers, gas station workers, and nearby vulnerable populations (e.g. residents, schools)**
- **Measurements of gasoline vapor releases** at gas stations for different pollution prevention technologies
- E²SHI Grant (Hilpert, Keeve Nachman, Jian Ni, Ana Rule): Public health impacts of gasoline vapor releases from gas stations: Developing regional standards, recommendations and informing environmental policies on vapor recovery