

Evaluating 6PPD Alternatives

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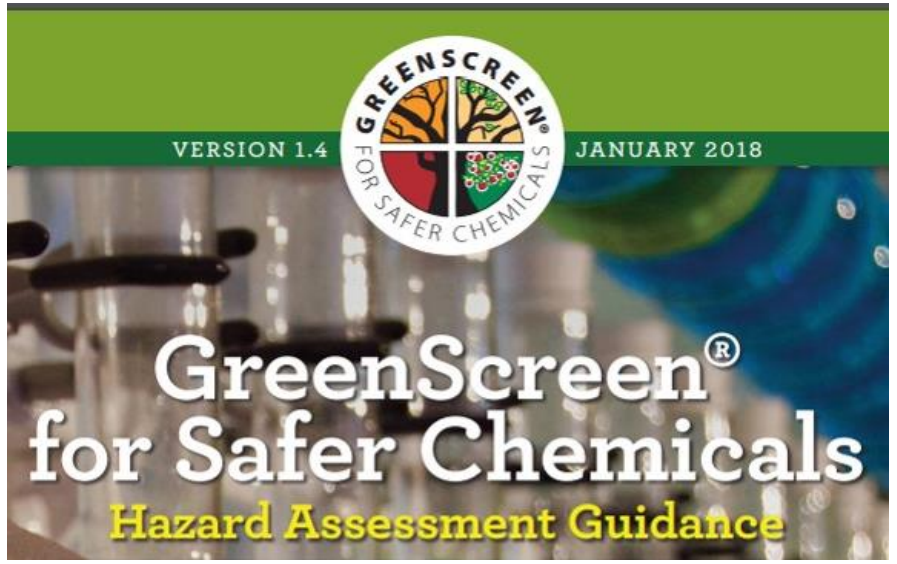
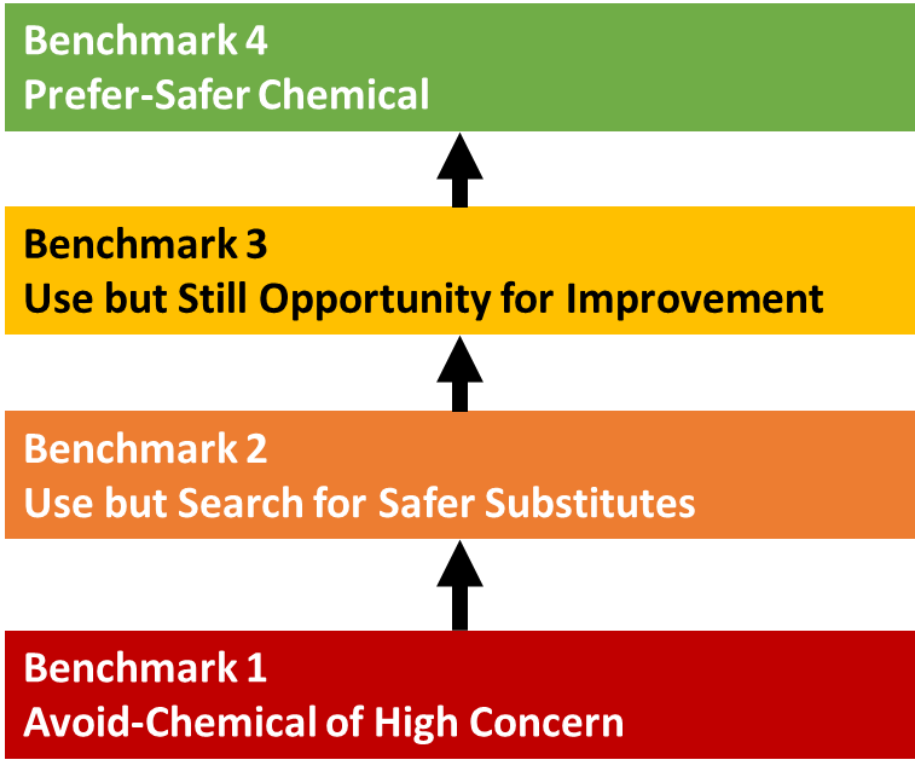
2021 Budget Proviso – HWTR Program

- Operating Budget, Section 302 (22)
  - $195,000 MTCA appropriation
  - Assess "potential hazards of 6PPD and other chemicals or chemical classes and breakdown products used as antioxidants and/or antiozonants in tires"
  - Submit technical memo by December 1, 2021
- Perform Greenscreen® assessments of 6PPD and nine potential alternatives
- Final technical memo submitted November 29, 2021
- Ecology EAP and Water Quality programs are also using proviso money to work on a report due in Nov. 2022.

Greenscreen® for Safer Chemicals

- Free tool to assess and compare hazards of different substances
- 18 hazard endpoints, including:
  - Persistence
  - Bioaccumulation
  - Carcinogenicity
  - Reproductive and developmental toxicity
  - Endocrine disruption
  - Aquatic toxicity
- Rates chemicals Benchmark 4 (preferred chemicals) through Benchmark 1 (hazardous chemicals)





GreenScreen® Results

Chemical and Chemical Abstract Service (CAS) Number	GreenScreen® Benchmark Score
6PPD (#793-24-8)	BM-1 – Avoid: Chemical of High Concern
77PD (#3081-14-9)	BM-2 – Use but Search for Safer Substitutes
CCPD (#4175-38-6)	BM-1 – Avoid: Chemical of High Concern
IPPD (#101-72-4)	BM-1 – Avoid: Chemical of High Concern
7PPD (#3081-01-4)	BM-1 – Avoid: Chemical of High Concern
TMQ (#26780-96-1)	BM-2 – Use but Search for Safer Substitutes
6QDI (#52870-46-9)	BM-1 – Avoid: Chemical of High Concern
NBC [Nickel dibutyldithiocarbamate] (#13927-77-0)	BM-1 – Avoid: Chemical of High Concern
Ethoxyquin (#91-53-2)	BM-2 – Use but Search for Safer Substitutes
Dilauryl thiodipropionate (#123-28-4)	$BM\text{-}3_{DG}$ -- Use but Still Opportunity for Improvement

Industry concerns about alternatives

Alternative	Benchmark	Industry Comments
77PD	BM-2	"…provides a shorter period of protection than 6PPD…. It is unclear how long the protection would last in a modern tire." "Equally important is the fact that as a member of the PPD family, it would be expected to form a quinone like 6PPD."
TMQ	BM-2	"By itself, it has been shown to have only 52% of the activity of 6PPD. By itself, it does not provide sufficient antiozonant protection to the rubber."
Ethoxyquin	BM-2	"In early studies, it was shown to be 87% as effective as 6PPD in the initial reaction with ozone….it is unclear how long protection would last. It is classified as mildly to moderately toxic."
Dilauryl thiodipropionate	$BM\text{-}3_{DG}$	"It is expected to have little, if any antiozonant activity."

Current Hurdles to Overcome

- Still developing toxicity data – we don't know whether alternatives are also toxic to salmon or other species
- Lack of information, especially about feasibility and performance needs – we aren't materials or manufacturing experts
- Don't want to duplicate other efforts, but currently there's no official coordination between researchers (*e.g.*, an MOA or clearinghouse)
- Still developing mitigation techniques – we know 6PPD-quinone is harder to treat and doesn't behave like other contaminants
- Solution will need to be multi-faceted – tires with 6PPD will be on the road for 10 or more years after manufacturers stop using it

Future Actions

- Funding further research to address data gaps
- 2022 Budget Proviso:
  - $1,322,000 MTCA appropriation
  - “complete a full safer alternatives assessment of the 6PPD compounds used in tires. The assessment shall incorporate and evaluate toxicity data of alternatives on Coho and other species.“
  - “if the department finds safer alternatives exist, include recommended regulatory, policy, or legislative actions to advance safer alternatives.”
  - No date specified for completion.

Questions?