

California Environmental Protection Agency



**Air Resources Board**

***Proposed Voluntary California Low  
Emissions and Reactivity Regulation  
for Aerosol Coatings***

**Public Workshop**

**El Monte, CA**

**March 18, 1999**

# Agenda

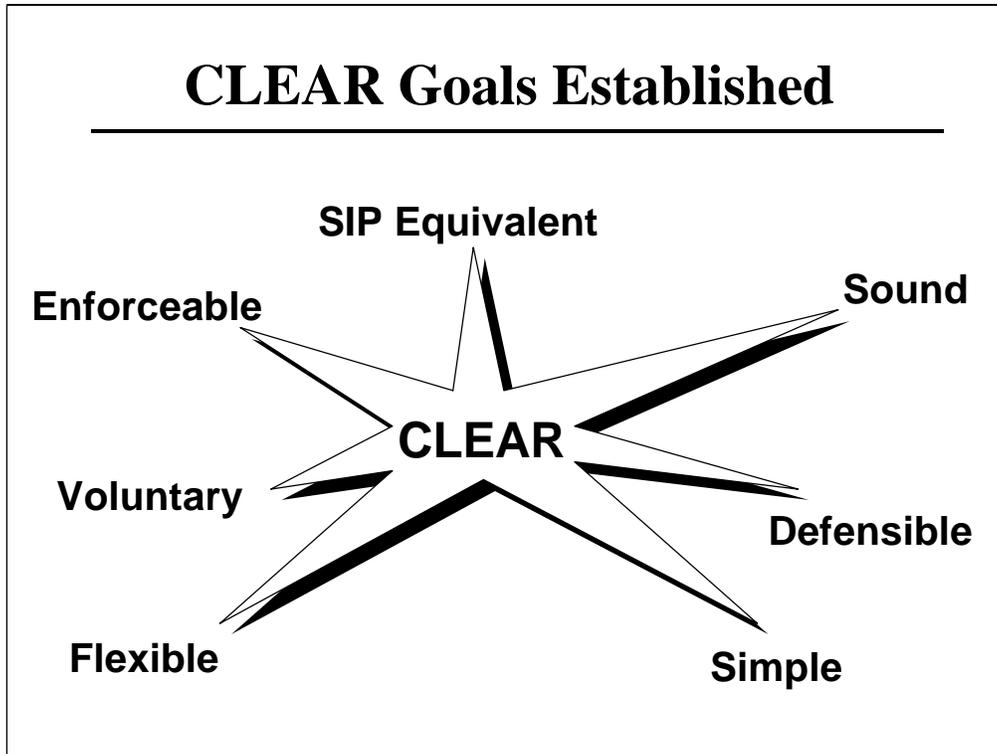
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- Overview of CLEAR Regulation
- Proposed Changes since August 1998
- Peer-Review of MIR Values
- Hydrocarbon Solvent Bins
- Uncertainty Factors
- Calculation of CLEAR Limits and Product Reactivity
- Timeline
- Program to Calculate Product Reactivity

In my presentation today, I am going to provide you with an overview of the regulation and the changes we are proposing to the regulation since last August's version.

Next, I'll go over the list of tasks for the scientific peer-review of the updated mechanism for determining MIR values.

I will also discuss the proposed hydrocarbon solvent binning approach, our proposal for uncertainty factors, the calculation of CLEAR limits, the calculation for an individual product reactivity, and end with the timeline for adopting this regulation. Following my part of the presentation, David Kemena will demonstrate a program to simplify calculating a product's reactivity. We will be happy to answer questions any time during the presentation.



•Many of you are familiar with this slide. These are the goals that we have identified in previous reactivity subgroup meetings in collaboration with industry. We have focused in working within these parameters since our first meetings started in 1995.

- Most of these are self-explanatory and I won't read them all, but I would like to highlight a few:
- First and foremost is that the CLEAR program achieves the equivalent reductions in ozone formation potential as the existing mass-based program. This ensures that the program provides an air quality benefit and doesn't negate the benefits we've achieved with the current mass-based program.
- Second, the program must be based on the most up-to-date and defensible science available to us.
- Third, the program should be a voluntary option for manufacturers to minimize disruptions to industry and to provide true flexibility to companies.
- We think the computer program we've developed will help make the program simple by calculating a product's reactivity.
- Finally, it goes without saying that the Regulation must be enforceable.

**Proposed Changes to Draft CLEAR  
Regulation for Aerosol Coating Products  
Sections 94530 - 94539**

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- Voluntary Alternative to the Existing Aerosol Coating Regulation
- Equivalent Reactivity-Based VOC Limits

As you know, this proposed regulation for aerosol coatings would create a voluntary compliance option for aerosol coating manufacturers.

The proposed CLEAR regulation is being designed to achieve equivalent reductions in ozone as would be achieved through the existing mass-based limits by establishing photochemical reactivity based VOC limits.

**Overview of Proposed CLEAR Regulation  
for Aerosol Coating Products  
Sections 94530-94539**

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- Reporting Requirements
- Test Method

I'd like to first discuss changes we are proposing since the last version of our proposed regulation in August of 1998. They are the reporting requirements section and the test method section, 94535c and 94537, respectively. Note that in the draft regulation, these changes are shown in ~~strikeout~~/underline. All language in the regulation is up for comment.

## **Reporting Requirements: Section 94535(c)**

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- Proposing to require formulation data
- Compliance Tool

We are proposing to change the reporting requirements to require that formulation data be supplied within 60 days of offering for sale. This is needed to meet compliance needs.

## **Test Methods: Section 94537**

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- Proposing to add provision to use Method 310 to determine VOC speciation of products
- Amendment of Method 310

We are also proposing language to clarify that Method 310 will be used to determine the VOC speciation of aerosol coatings. This will also require amendment to the existing Method 310. We'll be sharing draft language for amending Method 310 on April 15.

## **Scientific Peer Review of Updated Mechanism for Determining MIR Values**

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- Peer-review of the MIR values developed by Dr. Carter at UCR
- Conducted by Dr. Stockwell at DRI
- Final report expected May 1999

As a refresher, the photochemical reactivity of a VOC is a measure of the VOC's potential to form ozone once it is emitted into the atmosphere. Of the many different VOCs released into the atmosphere, each VOC reacts at a different rate and through a different chemical reaction mechanism. Hence, some VOCs have a higher potential to form ozone than others. By using reactivity-based scales, such as the maximum incremental reactivity (MIR) scale developed by Carter, we can compare the reactivity of one VOC to the reactivity of another.

Last year as we were developing the regulation, we informed you that Dr. Carter would be releasing new MIR values in August and that these values would be used in the regulation. However, in response to your comments, and the recommendations of RSAC, we delayed the regulation to allow for review of Carter's work. The ARB has now released a contract for review of the science behind the MIR values. The research is being conducted by Dr. Stockwell of Desert Research Institute. The research consists of a peer-review of the MIR values developed by Dr. Carter. And next is the list of tasks for the research contract.

The final report for the peer-review is expected to be released in May 1999.

## Scientific Peer Review - Tasks

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**Task 1**: Evaluate the Base Mechanism

**Task 2**: Review the VOCs Represented Using the Assigned Mechanistic Parameter Method

**Task 3**: Review the Use of the “Lumped Molecule” Approach

**Task 4**: Evaluate the Handling of Uncertainty in both the MIR and the Regulation

**Task 5**: Review the Mechanism Documentation

**Task 6**: Final Report

We include this slide to assure you that this is a thorough review. You also should be aware that this review may result in changes to some of our current proposals.

The first task is to evaluate the base mechanism. This is essentially a review to validate the MIR values. Task 2 is to review the VOCs represented using the assigned mechanistic parameter method. Task 3 involves reviewing the use of the “Lumped Molecule” approach. Task 4 is to evaluate the handling of uncertainty in both the MIR and the regulation. Task 5 is to review the Mechanism Documentation and Task 6 to release a final report.

## **Public Review Process**

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- RSAC Review
- Public Workshop

After the report is released, we plan to discuss the report with members of the Reactivity Scientific Advisory Committee. Also we will hold a workshop on our proposal which incorporates changes resulting from the peer review.

## Hydrocarbon Solvent Bins

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- “Mineral Spirits”
- Assignment of MIR values
- Binning Criteria
  - Boiling Range
  - Alkanes
  - Aromatics
- Use reviewed MIR values

You have asked us how MIR values for hydrocarbon solvents were assigned and how you would know which bin your hydrocarbon solvents are in.

Mixtures of hydrocarbon solvents, such as mineral spirits, typically may contain paraffinic, isoparaffinic, cyclic, and aromatic compounds.

One approach we are considering to identify the classes or bins of mineral spirits is to assign an MIR value to each bin.

In designing proposed bins, we can use certain characteristics to assign MIR values. The boiling range is the first criterion because that determines the size of the hydrocarbon constituents. For example, a hydrocarbon of 6 or 7 carbons will boil at 100 to 240 degrees Fahrenheit; a hydrocarbon of 8 or 9 carbons will boil at 240 to 310 degrees Fahrenheit.

The other criteria include the blend’s alkane and aromatic content. Aromatic hydrocarbons generally have higher reactivities than their paraffinic, isoparaffinic, or cyclic counterparts. Most hydrocarbon solvents are predominantly alkanes with some having aromatic content up to about 20 percent. We will continue to work with hydrocarbon solvent manufacturers to refine the binning criteria, MIR values, and a mechanism to identify bins to customers.

MIRs will be assigned pending completion of the peer review.

## Uncertainty Factors

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- Uncertainty in MIR values
- Dr. Carter's uncertainty rankings
- Designed to ensure air quality benefit
- Under Review

We've also received questions on applying uncertainty factors to certain VOCs. Depending on the compound, the MIR value has an uncertainty associated with it. One of our tasks is to find a way to be able to use all VOCs in a reactivity program. For compounds that have MIRs with a higher degree of uncertainty, we need to establish a way to account for that uncertainty.

Many compounds have been well-characterized through research to reduce the level of uncertainty. And we are fortunate that there is a good match between this group of compounds and those used in aerosol coatings.

Based on Dr. Carter's recent work, we refer to this group as the "1-4s," following his uncertainty rankings. Because of adequate data on these VOCs, there may not be a need to adjust these values. The compounds with uncertainty of 5 or greater are those that less data are available. To help ensure that the reactivity-based re-formulations preserve the reductions in ozone formation already achieved under the VOC mass-based programs, the uncertainty needs to be accounted for.

As you know our present approach is to apply adjustment factors that are reflective of the current state of knowledge for the reactivity of that compound.

## Uncertainty Factors - Present Approach

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- Factor of 1 for Categories 1-5 and 9
- Factor of 2 for Categories 6-8, 10-11
- Apply factors to limit and product
- May change pending Peer Review

This slide shows our current proposal. For those compounds that fall into Categories 1-5 and 9, no adjustment factors would be applied. This is because the categories 1-5 and 9 contain compounds that are well-studied or may overpredict ozone formation, as in category 9. For those compounds that have greater uncertainties, such that they fall into categories 6-8, 10, and 11, an adjustment factor of 2 would be applied. These bins and adjustment factors, as well as how they are applied, may change pending the outcome of the peer review.

In the draft proposal, we evaluated applying uncertainty factors to both the limit and product reactivity calculations. However, we note that several members of the RSAC indicated that to ensure an air quality benefit, the factors should be applied to calculating the reactivity of the product only.

## **Present Methods for Calculating CLEAR Limits**

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- **Two Methods Proposed**
  - Method depends on # of products now complying with mass-based limits
- **Percent Reduction Method**
  - General Coatings Categories and 20 Specialty Coatings Categories
  - Percent reduction from SWA-MIR of products reported
- **Complying Products Method**
  - For remaining 9 aerosol coating categories
  - SWA-MIR of complying mass-based products = **CLEAR limit**

For calculating what the CLEAR Limits should be, we are currently proposing two methods for the aerosol coating categories. These methods are the percent reduction and the complying products method.

The percent reduction method was used for the general coatings, ground traffic/marketing paints, and 19 other specialty categories. The lists of categories is in your handouts.

The complying products method was used for 9 specialty categories of aerosol coatings. In these aerosol coating categories, nearly 100 percent of the products are able to comply with the adopted mass-based VOC limits. In these instances the percent reduction method does not work.

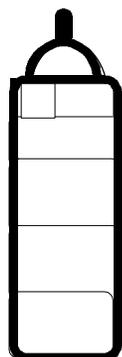
## **Methods for Calculating CLEAR Limits**

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- Ensure Equivalent O<sub>3</sub> reduction
- Re-evaluation of present methods
- Method refinement, if necessary

The protocol that ultimately goes into the calculations of limits must provide equivalency. Depending on the outcome of our analyses, the methods may need further refinement. We'll keep you apprised of any modifications.

## Composite Paint Formula and Calculation of Weighted Reactivity



Contents	Weight Percent	MIR (Absolute Scale)	Weighted Reactivity
acetone	35%	0.48	0.17
toluene	15%	4.19	0.63
propane	20%	0.64	0.13
xylene	10%	7.77	0.78
butane	5%	1.44	0.07
solids	15%	0	0.00
<b>Total</b>	<b>100%</b>		<b>1.78</b>

**Product  $MIR_{abs} = 1.78 \text{ g O}_3/\text{g product}$**

Here is an example of how one would calculate an individual product reactivity. The MIR values used in this example are from Dr. Carter's August 1998 list and could change based on review.

## Updating MIRs

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- Sound Science
- Regulatory Process

We are committed to sound science in the reactivity program. We will continue to track the science and may need to update the MIR values only if there are significant differences. In the Low Emissions Vehicle Program, the reactivity numbers are re-examined every three years. As for the reactivity regulation for aerosol coatings, we may consider a similar time frame.

As with any changes to the regulation, any proposed changes to the MIR values in the reactivity regulation for aerosol coatings would be a regulatory process. Meetings and public workshops would be held to discuss such changes.

## **CLEAR Regulation Timeline**

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- CPWG - 4/14 - 4/15/99
- Release of Final Report from Dr. Stockwell - 5/99
- Public Workshop (tentative) - 5/99
- Release Draft Regulation w/ CLEAR Limits - 6/99
- Public Workshop (tentative) - 6/99
- Proposed Regulation and Technical Support Document Released - 7/99
- Board Hearing - 9/23/99

Here is the timeline for developing the CLEAR regulation. We are expecting to go to the Board in September. Workshops are tentatively scheduled to be held in April, May, and June. As I mentioned earlier, Dr. Stockwell's report is expected to be final in May in which we plan to discuss at the workshop. At the June workshop, we expect to have a draft regulation with CLEAR limits for discussion.



Too complicated? We can help. We are developing a computer program to help. We hope this will help simplify calculating product reactivity and welcome any comments and ideas that you may have. David Kemena will demonstrate an example calculation with the program.