Optical Reflector Design using the TracePro Interactive Optimizer

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Format

• A 25-30 minute presentation followed by a 10-15 minute question and answer session

• Please submit your questions anytime using Question box in the GoToWebinar control panel
Optical Reflector Design using the TracePro Interactive Optimizer

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In this webinar you will:

• Learn how to use the TracePro Interactive Optimizer to design optical reflectors.

• Find out how the Interactive Optimizer uses the Surface Property catalog in TracePro to model different reflector coatings.

• Discover how you can use the Scheme macro language in conjunction with the Interactive Optimizer to expand its capabilities.
In this webinar you will:

• Gain an understanding on how to set up your sources and targets in TracePro and define suitable optimization targets.

• See examples of reflector designs created using the Interactive Optimizer such as trough reflectors with curved ends, facetted reflectors with non-uniform faceting, and off-axis reflector segments.

• Have your questions answered in the Question and Answer session.
Additional Resources

• Past TracePro Webinars

  • February 2010 - *Interactive Optimizer*
  • March 2010 - *Interactive Optimizer*
  • July 2010 - *Modeling Light Sources in TracePro*
  • September 2010 - *Interactive Optimizer*
  • February 2011 - *Analysis Tools in TracePro*
  • June 2011 - *LED Lighting Design using TracePro*
  • July 2011 - *Scheme Macro Language*

Current TracePro Release

• TracePro 7.1.2

• Can be downloaded by anyone with a current Maintenance and Support Agreement

• www.lambdares.com
Optical Reflector Design using the TracePro Interactive Optimizer
Interactive Optimizer is launched from the Utilities Menu in TracePro
TracePro Interactive Optimizer

Initial windows visible when the optimizer is opened
Lens design in the Interactive Optimizer

Lens index of refraction
1. Select the segment that will be used as the reflector

2. Switch to Object tab

3. Select “Reflector?” to turn the segment into a reflector

4. Rays are now shown as being reflected

Reflector design in the Interactive Optimizer
The optimizer uses your existing TracePro property database. Any custom Surface Properties you have defined in TracePro are available in the optimizer.

Select the Surface Property you want to use before exporting the reflector to TracePro.
TracePro Interactive Optimizer

Applying Surface Properties in the Interactive Optimizer

Alanod Miro27 Surface Property applied to inside surface of reflector
TracePro Interactive Optimizer

Each segment can have a different Surface Property
Different surfaces can have different Surface Properties
TracePro Interactive Optimizer

Interactive Optimizer geometry creation options:

- Radial symmetry
- Biaxial
- Extrusion
- Revolve
- Path sweep
Using the Scheme Macro Language with the Interactive Optimizer
Scheme Macros and the Interactive Optimizer

Easy - extruded trough reflector
Scheme Macros and the Interactive Optimizer

A little more difficult - extruded trough reflector with curved ends
Scheme Macros and the Interactive Optimizer

Optimizer Sketch window for extruded trough reflector with curved ends
Scheme Macros and the Interactive Optimizer

Optimizer Sketch window for extruded trough reflector with curved ends

20mm

100mm
Scheme Macros and the Interactive Optimizer

Initial results after exporting the 2 profiles from the optimizer as extrusions
To make the final trough reflector we need to write a Scheme macro to:

1. Rotate the long trough segment 90-degrees
2. Unite the 2 trough segments into a single object
3. Apply a Surface Property to the reflector to model the reflective finish
Scheme Macros and the Interactive Optimizer

Adding a Scheme macro in the Optimization window

Double click in the “After-scheme” box to open the macro editor

Note the Extrusion lengths
Scheme Macros and the Interactive Optimizer

Adding a Scheme macro

Syntax help for Scheme commands
Scheme Macros and the Interactive Optimizer

Scheme macro to:

1. Rotate the long trough segment 90-degrees
2. Unite the 2 trough segments into a single object
3. Apply a Surface Property to the object to model the reflective finish
4. Update the System Tree
Right click in the “After-scheme” box and choose “Create model & run cmd” to export the model and check the results in TracePro.
Scheme Macros and the Interactive Optimizer

Extruded trough reflector with curved ends in TracePro
Defining Sources and Targets
Defining Sources and Targets

A copy of the reflector can be exported from the optimizer and used in TracePro to set-up the sources and the targets, if required.

The Interactive Optimizer will use the sources defined in the TracePro model during the optimization.

Any type of source can be used: Grid, File, Surface, or a combination.

11 LEDs used as sources.
Defining Sources and Targets

Two common optimization targets are Irradiance and Candela Profiles

Irradiance Map

Candela Plot

Two common optimization targets are Irradiance and Candela Profiles
Defining Sources and Targets

If you are using an Irradiance Profile as the optimization target, you must have a surface in TracePro for the Irradiance Map.
Defining Sources and Targets

The name of the Surface in the TracePro model for the Irradiance Profile is entered here.

The Vertical Profile corresponds to the Up Vector setting in the TracePro Irradiance Map Options.

Different Irradiance Profile optimization targets can be defined for the horizontal and vertical axes.
Defining Sources and Targets

The Up Vector will determine the Vertical Profile in the optimizer Irradiance Profile operand.
Defining Sources and Targets

Different Irradiance Profile optimization targets can be defined for the horizontal and vertical axes.

The name of the Surface in the TracePro model for the Irradiance Profile is entered here.

Horizontal Profile
Defining Sources and Targets

When optimizing to a Candela Profile operand, a surface in TracePro does not have to be used as a target. For the Candela Profile operand, if a surface in TracePro is not used as a target, select “Exiting ray”. If a surface is to be used as the target, select “Incident ray” and enter the name of the surface in the Surface column.
Defining Sources and Targets

The 0-degree Azimuth corresponds to the Up Vector setting in the TracePro Candela Plot Options.

Different Candela Profile optimization targets can be defined for different axes.
The Up Vector will determine the 0-degree Azimuth in the optimizer Candela Profile operand.
Defining Sources and Targets

Second Candela Profile operand defined along the 90-270-degree Azimuth

Different Candela Profile optimization targets can be defined for different axes
Examples
Examples

Trough reflector with curved ends and 3 cut-outs for LEDs – TracePro model
Examples

Trough reflector with curved ends and 3 cut-outs for LEDs – Interactive Optimizer Sketch window

Object to use for LED cut-outs
Examples

Trough reflector with curved ends and 3 cut-outs for LEDs – Optimization window and Scheme macro
Examples

Off-axis reflector – TracePro model
Examples

Off-axis reflector – Interactive Optimizer Sketch window

Base reflector

Off-axis segment
Examples

Off-axis reflector – Optimization window and Scheme macro
Examples

Faceted reflector – TracePro model
Examples

Faceted reflector – Interactive Optimizer Sketch window

Select “Faceted?” and enter the number of Facet segments
Examples

Faceted reflector – Optimization window

Number of Steps for revolving the faceted profile
Examples

Faceted reflector 2 – TracePro model
Examples

Faceted reflector 2 – Interactive Optimizer Sketch window

Subtract this object to make the hole for the lamp
Examples

Faceted reflector 2 – Optimization window and Scheme macro

Number of Steps for revolving the faceted profile
Examples

Fluorescent lamp fixture louvers– TracePro model
Examples

Fluorescent lamp fixture louvers– TracePro model
Examples

Use the Pickup option so that these 2 points always move together.

Louvers – Relative and Pickup variables
Examples

Louvers—Relative and Pickup variables
Examples

cpx(2,0) = This control point will always have the same X value as Control Point (2,0)

cpy(2,0)-55 = This control point will always have a Y value 55mm below Control Point (2,0)

For Segment Points, change cpx and cpy to spx and spy

Louvers—Pickup variable
Examples

• To find the Segment number and Control Point number for a Control Point, click on the Control Point in the sketch window and read the values at the top of the sketch window.

• Format is (segment #, control point #)

Louvers—Control Point number
Examples

Louvers–Optimization window and Scheme macro
Thank You
Questions and Answers