How to Comply with EPA Regulations for Stationary Reciprocating Internal Combustion Engines (“RICE”)

- Roy Crystal, EPA Region 1 (New England)

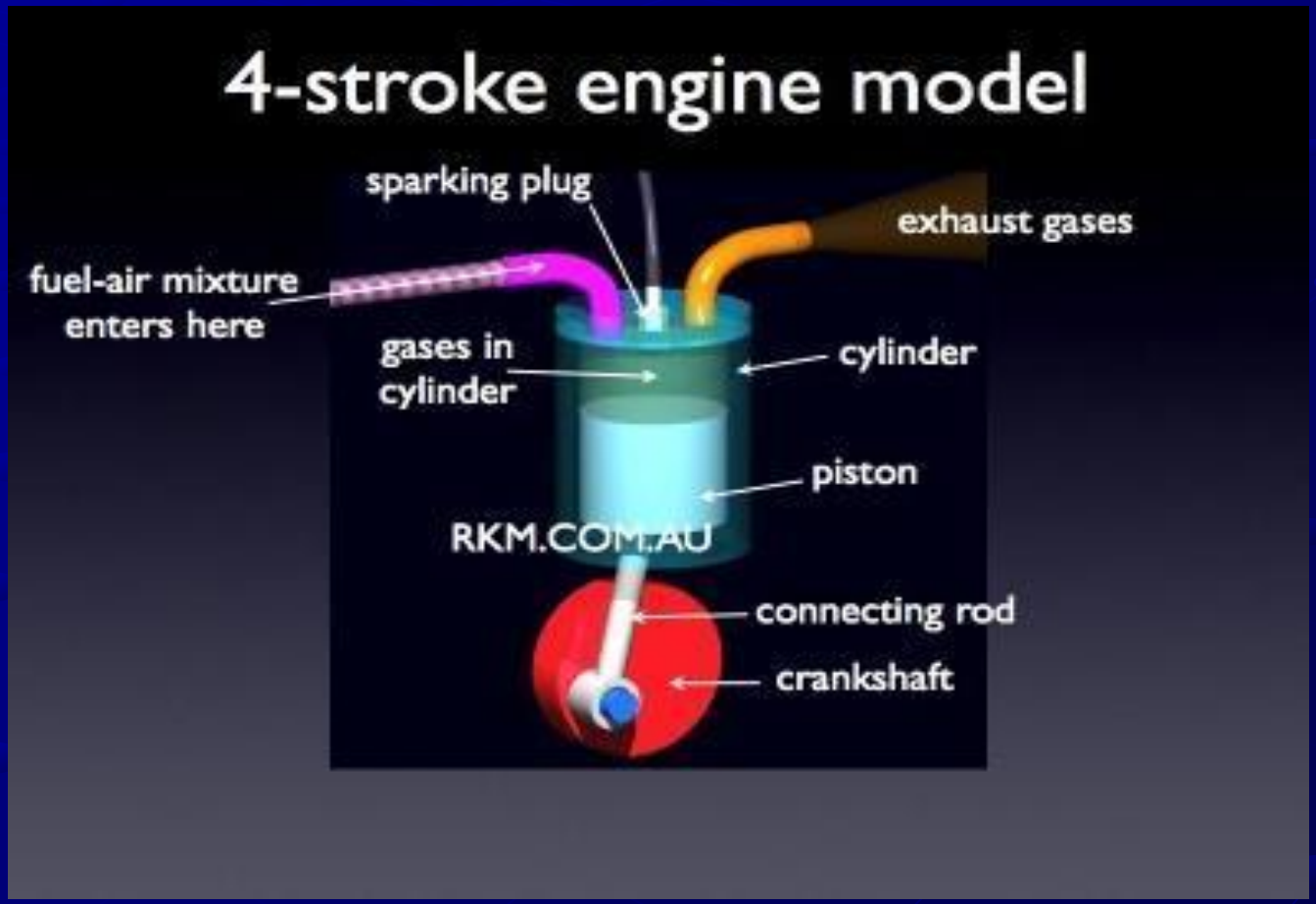
Overview

- How RICE & RICE Emission Controls Work
- Common RICE Uses
- Compliance Requirements & Challenges
- Case Study – NH Asphalt/aggregate Plant
- Resources to Help you Comply
- Effective Compliance Strategies

What is a Reciprocating Internal Combustion Engine ("RICE")?

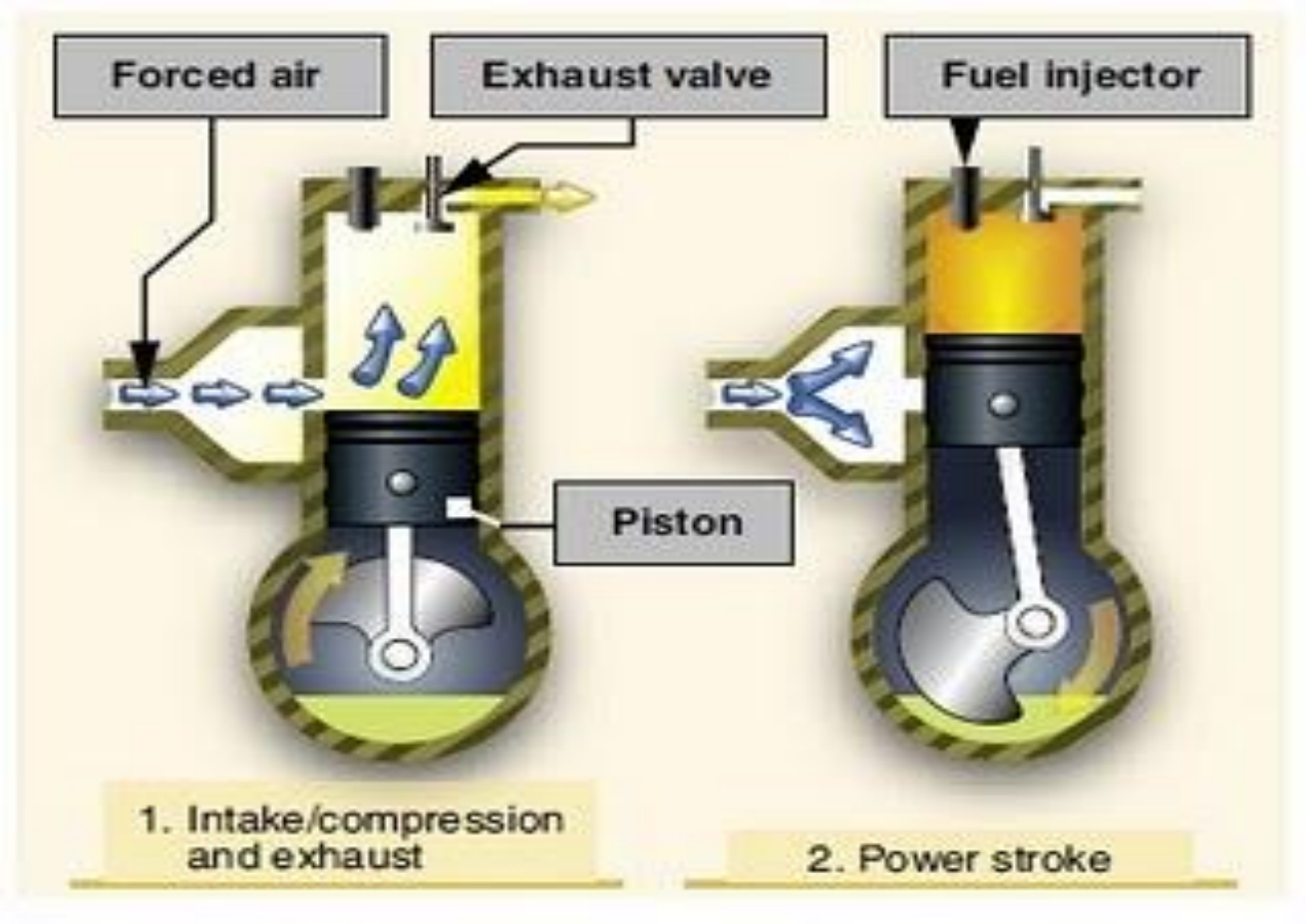
- Reciprocating engine (aka piston engine) - heat engine that uses reciprocating pistons (which alternatively move back and forth) to convert pressure into rotating motion – several types, including internal combustion
- Internal combustion engine - combustion of a fuel with an oxidizer (air) occurs in a combustion chamber
- Expansion of high temp. & pressure gases applies force to piston or turbine blade – generating mechanical energy
- Fuel ignited by spark ("spark ignition", gasoline) or by heat of compression ("compression ignition" or "diesel", diesel fuel)

Four Stroke Spark Ignition Engine



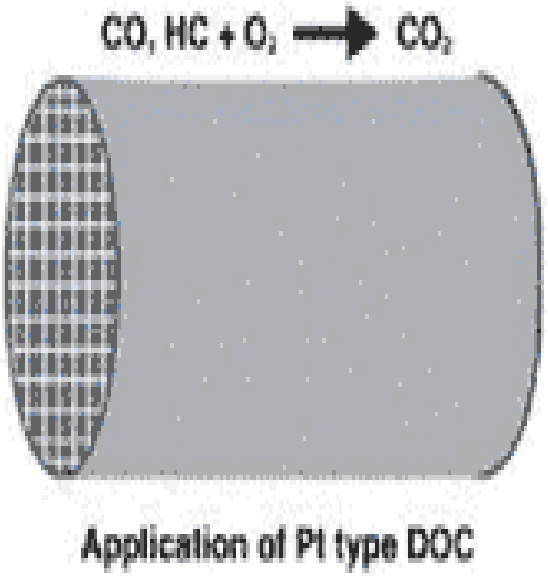
Source: Rkm.com.au

Compression Ignition Engine



Source: Flightlearnings.com

Oxidation Catalyst



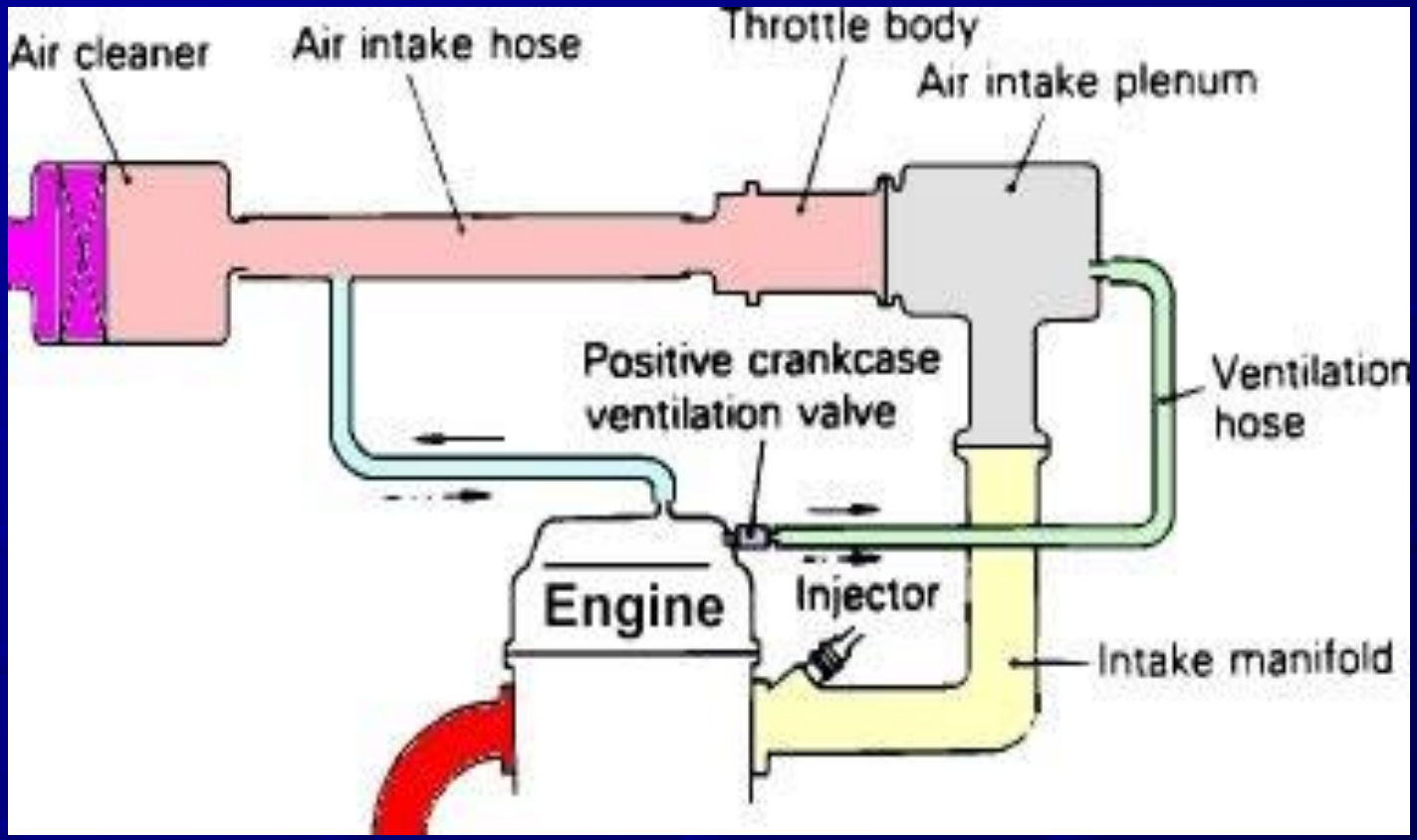
Application of Pt type DOC

Diesel oxidation catalysts (DOC)

- Reduction of carbon monoxide and hydrocarbons by more than 90%
- Reduction of particulate emissions by up to 25%
- Light and heavy-duty applications

Source: http://www.omnitekcorp.com/catsdocdpf.htm

Closed Crankcase Ventilation System



Source: https://sites.google.com/a/swedishmotors.com/swedish-motors-inc/home/service-and-parts-information/articles/pcv-system

RICE Are Used to…

- move a vehicle (not a stationary source, so not regulated by air toxics program)
- generate electric power – for sale, onsite use, emergency backup (including combined heat and power uses)
- generate electric power onsite to run another machine
- power a compressor – by direct mechanical energy
- power a pump – by direct mechanical energy

What Sectors in NE have RICE Engines?

- Looked at 98 Region 1 RICE notifiers by NAICS Codes – 71 known
- NAICS 221 – Utilities (16)
- NAICS 444 – Building & Garden Equipment & Supplies Dealers (6)
- NAICS 423 – Merchant Wholesalers, Durable Goods (5)
- NAICS 622 – Hospitals (4)
- NAICS 611 – Educational Services (4)
- NAICS 313 – Textile Mills (3)
- NAICS 237 – Heavy & Civil Engineering Construction (3)
- NAICS 238 – Specialty Trade Contractors (3)
- NAICS 327 – Nonmetallic Mineral Product Manufacturing (3)
- NAICS 336 – Transportation Equipment Manufacturing (3)
- NAICS 928 – National Security & International Affairs (3)

What Other Sectors in NE Probably have RICE?

- NAICS 48621 – Natural gas transmission
- NAICS 713920 – Skiing facilities (snowmaking)
- NAICS 323 - Printing
- NAICS 21231 – Stone Mining & Quarrying
- NAICS 421930 – Recyclable material
- NAICS 711310 (sports arenas) & 713940 (ice skating rinks)
- Potentially anywhere producing electric power for onsite use, or running a pump or compressor

RICE Powering Crusher at Sand & Gravel Plant

Source: New Hampshire Dept. of Environmental Services

Compliance Requirements & Challenges

- Initial notification required. Reporting dates have passed – August 31, 2010 (CI) & February 16, 2011 (SI)
- Only about 100 notifications received in the region – who is missing?
- Limited assistance to date by EPA headquarters & states
- Some good resources available
- Several industrial/commercial sectors use RICE engines – how to reach them all?
- Compliance dates for existing engines: May 2013 (CI) and October 2013 (SI) - we have some time
- Requirements complex – opportunities to clarify
- Coordination with existing state requirements
- Some sources will find compliance difficult

Compliance Requirements & Challenges – contd.

- Need to clarify - “what is an emergency engine?”
- Demand response use of engines encouraged – only Independent System Operator (ISO) knows
- Use engine too much (time limits) – sources may become subject to RICE NESHAP non-emergency engine requirements!

Where to Send Notifications, Reports, Performance Test Protocols

Sources in New England send to*:

US Environmental Protection Agency Region 1
5 Post Office Square, Suite 100
Mail code: OES04-2
Boston, MA 02109-3912
Attention: Air Clerk

*Also send notifications & reports for all sources to New Hampshire; in all other New England states, send state only reports for sources with Title V operating permits.

Preparing for a Performance Test

- Submit Notification of Performance Test

  at least 60 days in advance of test date
- EPA Region 1 requires test protocol for all performance tests (submit with notification); may observe test
- Contacts for questions at EPA Region 1

  lab : William Osbahr – 617-918-8389, Osbahr.William@epa.gov; Michael Looney, 617-918-8665, Looney.Mike@epa.gov
- EPA Guidance Documents 042 and 043 for Test Protocols and Test Reports

  - **http://www.epa.gov/ttn/emc/guidlnd.html**

RICE NESHAP Requirements for Operating Emergency Engines

- 100 hour limit for maintenance checks & readiness testing
- 50 hours per year allowed for non-emergency uses, counted toward 100 hour total limit
- 15 hours per year permitted as part of demand response program, counted as part of 50 hour non-emergency use (proposed settlement to increase 15 hours to 60 hours)
- Existing residential, commercial, institutional emergency RICE are not covered by rule but must meet above 3 provisions to be considered emergency

RICE NESHAP - Issues with Operating Emergency Engines

- Owners of all affected emergency RICE need to install non-resettable hour meters & record hours of operation
- Bottom line – now you have to track & manage your engine use to avoid exceeding usage limits under the definition of emergency
- If you run your engine in excess of allowable non-emergency hours/year – you have to comply with RICE NESHAP requirements for non-emergency engines

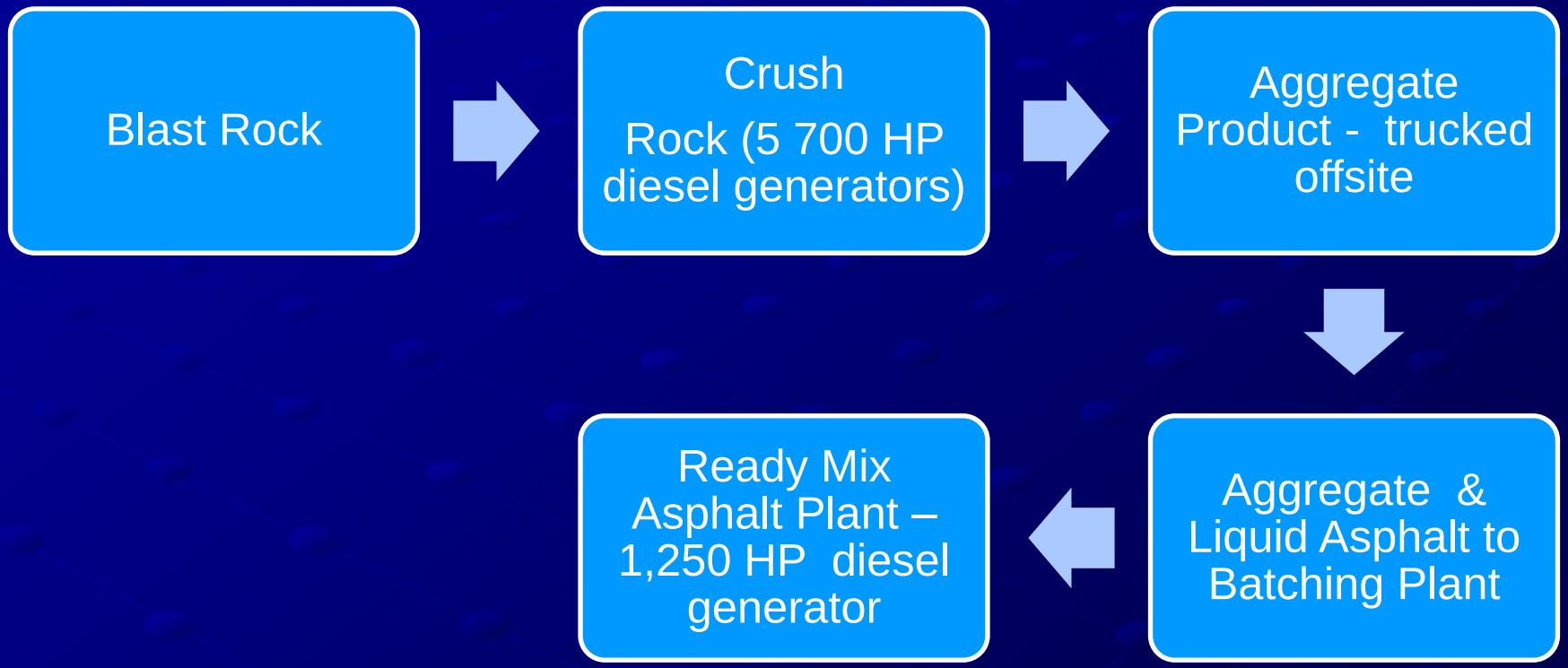
When May Sources Find it Costly or Difficult to Comply?

- Scenario 1 – a stone mining & crushing facility far from the grid that uses large RICE engine to run crusher & may operate only seasonally – high cost to retrofit and test
- Scenario 2 – a small facility with a large, older diesel engine – if manufacturer can't supply an oxidation catalyst or do so at manageable cost
- Scenario 3 – Sources that want to use engines for infrequent non-emergency use that have not set aside funds to retrofit (municipalities?)

Possible Cost of RICE Compliance

- Performance testing – $1,000 & up?
- Non-resettable hour meters – $25-35
- Diesel oxidation catalyst capital cost for a 500 hp diesel engine – $27.4 x horsepower - $939, approx. $13,000 (EPA estimate)
- Diesel oxidation catalyst annual operating cost for a 500 hp diesel engine - $4.99 x horsepower + $480, approx. $3,000
- Oxidation catalyst capital cost for 500 hp four stroke lean burn spark ignition engine -$12.8 x horsepower + $3,069, approx. $10,000
- Closed or open crankcase ventilation system - $650-1,000
- Quotes may vary substantially for differing technologies
- New engines are expensive but may be more efficient

Case Study of NH Aggregate/Asphalt Plant – Simplified Process Flow



Case Study – NH Aggregate & Asphalt Plant

- Facility operates 3 crushers, asphalt plant w. 6 CI stationary RICE, 250 gal. diesel fuel/day
- $125,000 quote to retrofit 1250 HP Caterpillar 3508 CI generator
- 700 hp engines may have lower retrofit costs
- $7,500/engine for perf. testing, $30,000/site
- $500,000 one-time cost to convert to grid
- Other technologies may be available

Granite Blasting/Removal

Rock Crushing

RICE CI Generators for Rock Crusher

Ready Mix Asphalt Plant

Considering Engine Retrofit or Replacement

- Explore availability of new technologies
- Get several quotes – they may vary widely
- Compare efficiency of current & new engines & fuel costs
- Carefully assess capital and operating cost tradeoffs – use business math techniques like calculating Net Present Value of investment & Rate of Return

Tools for Complying with RICE Rules

- Powerpoints from this workshop, past webinars
- Applicability flowchart
- RICE Summary Table of Requirements (good – but hard to print)
- Regulation Navigation Tool
- Example Forms for Initial Notification & Notification of Compliance Status – EPA Region 1 RICE webpage, Combustion Portal

Some Useful Compliance Tools

- **EPA Region 1 RICE webpage – www.epa.gov/region1/rice - "plain language" summary of RICE NESHAP & NSPS, summary tables, sample Initial Notification and Notification of Compliance Status Forms, events, state contacts, links**
- **EPA Technology Transfer Network Air Toxics website RICE page - www.epa.gov/ttn/atw/rice/ricepg/html#IMP -proposed and final rules, docket index, technical information, fact sheets, training materials**
- **EPA Combustion Portal – www.combustionportal.org, source for EPA combustion-related air quality regulations including RICE & Boiler NESHSAP and RICE NSPS; useful "calculator" for CI RICE NESHAP gives actual compliance requirements; detailed summary of RICE NSPS standards**

Suggested Procedure for RICE NESHAP & NSPS Compliance

- Inventory your RICE – type, date of installation, horsepower (HP)
- Track RICE use – past & present non-emergency, maintenance/testing, demand management hours/yr
- Determine applicable EPA & state requirements & compliance dates
  (try EPA R. 1 RICE webpage & Combustion Portal RICE NESHAP Tool – calculator for CI engines)
- Submit any required initial notifications to EPA – if past due,
  send in as soon as possible
- Note thresholds that define emergency engine & stay within them
- If emergency engine subject to RICE rule, install hour meters
- Get help understanding compliance requirements – web pages, EPA & state assistance staff, consultants

Suggested Procedure for RICE NESHAP & NSPS Compliance - contd.

- Consider pollution prevention & energy efficiency as compliance strategies - e.g. reduce RICE use by changing operations, connect to grid, combined heat & power, more efficient new engine
- If your RICE have emission limits & may need retrofit, get engineering help from manufacturer, control firms, consultants
- Explore help w. energy efficiency assessment & $ for efficiency improvements from utility industrial energy conservation programs
- If performance test required, locate qualified firm, send in Notification of Performance Test, complete test; allow extra time!
- Submit NESHAP Notification of Compliance Status to EPA – 2013 compliance date for existing CI & SI engines

Need More Help or Info?

Roy Crystal, Region 1 RICE Assistance Lead
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Susan Lancey, Region 1 Air Toxics Coordinator (contact for RICE applicability determinations)
Lancey.Susan@epa.gov, 617-918-1656

Other EPA Regions:
EPA Regional Air Toxics Coordinators -
http://www.epa.gov/ttn/atw/area/regional_contacts.pdf