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Engine Coolant Technology Engine Coolant Testing : Fourth Volume High-Performance Automotive Cooling Systems Engine Coolant Technologies Methods and Equipment for Engine Coolant Testing Engine Coolant Testing: State of the Art Engine Coolant Testing SELECTION and USE of ENGINE COOLANTS and COOLING SYSTEM CHEMICALS Engine Coolant Testing, Third Volume Engine Coolant Testing (2nd Symposium) Engine Coolants A Comparison of Membrane Technologies for Engine Coolant Recycling Selection and Use of Engine Coolants and Cooling System Chemicals Engine Coolant Performance in Late Model Passenger Cars Engine Coolant and Antifreeze Bittering Agent Act of 2005 S. 1110, the Engine Coolant and Antifreeze Bittering Agent Act of 2005 Electronic Control of Engine Coolant Temperature Thermal Stratification Potential in Rocket Engine Coolant Channels Engine Coolant Technologies: 5th Volume Engine Coolant Testing Heavy Duty Diesel Engine Coolant Technology Development of Mobile, On-Site Engine Coolant Recycling Utilizing Reverse-Osmosis Technology Automotive Cooling System Basics Overview of Engine Coolant Testing in Europe with Particular Regard to Its Development in Germany S. 1110, the Engine Coolant and Antifreeze Bittering Agent Act of 2005 Auto Repair For Dummies Engine Coolant Testing Engine Coolant Testing : State of the Art S. 1110, the Engine Coolant and Antifreeze Bittering Agent Act of 2005 Engine Coolant Compatibility with the Nonmetals Found in Automotive Cooling Systems Engine Coolant Technology, Performance, and Life for Light-Duty Applications Heavy-duty Fleet Test Evaluation Of Recycled Engine Coolant Engine Cooling Systems HP1425 Engine Coolant Concentrate-- Ehtylene-glycol Type Engine Coolant Testing Static Vehicle Corrosion Test Method and Its Significance in Engine Coolant Evaluations for Aluminum Heat Exchangers Project Summary, Automotive and Heavy-duty Engine Coolant Recycling by Distillation Engine Coolant Testing: State of the Art. A Symposium Sponsored by ASTM Committee D-15 on Engine Coolants, American Society for Testing and Materials, Atlanta,Ga. 1979 Characterization of Used Engine Coolant by Statistical Analysis Engine Coolant Testing

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Recently there has been interest by motor vehicle manufacturers in developing longer-lived automotive engine coolants with an emphasis on organic acid technology (OAT) [1]. Paradoxically, the lifetime of conventional technology remains largely undefined. Concerns arising from the depleting nature of silicate have led to modern conservative change recommendations of 30 000 to 50 000 miles (~48 279 to 80 464 km) [2]. When considering how well modern cars perform in many areas, it is easy to forget some of the issues motorists had on a regular basis 40+ years ago. Cars needed maintenance regularly: plugs and points had to be replaced on a frequent basis, the expected engine life was 100,000 miles rather than double and triple the expectation that you see today, and an everyday hassle, especially in warm climates, was being the victim of an overheating car. It was not uncommon on a hot day to see cars stuck in traffic, spewing coolant onto the ground with the hoods up in a desperate attempt to cool off. Fast-forward to today, and it’s easy to forget that modern cars even have coolant. The temp needle moves to where it is supposed to be and never moves again until you shut the car off. For drivers of vintage cars, this level of reliability is also attainable. In High-Performance Automotive Cooling Systems, author Dr. John Kershaw explains the basics of a cooling system operation, provides an examination of coolant and radiator options, explains how to manage coolant speed through your engine and why it is important, examines how to manage airflow through your radiator, takes a thorough look at cooling fans, and finally uses all this information in the testing and installation of all these components. Muscle cars and hot rod engines today are pushed to the limit with stroker kits and power adders straining the capabilities of your cooling system to extremes never seen before. Whether you are a fan of modern performance cars or a fan of more modern performance in vintage cars, this book will help you build a robust cooling system to match today’s horsepower demands and help you keep your cool. A 240 000 mile (386 232 km) fleet test was conducted to evaluate recycled engine coolant against factory fill coolant. The fleet consisted of 12 new Navistar International Model 9600 trucks equipped with Detroit Diesel Series 60 engines. Six of the trucks were drained and filled with the recycled engine coolant that had been recycled by a chemical treatment/filtration/reinhibited process. The other six test trucks contained the factory filled coolant. All the trucks followed the same maintenance practices which included the use of supplemental coolant additives. The trucks were equipped with metal specimen bundles. Metal specimen bundles and coolant samples were periodically removed to monitor the cooling system chemistry. A comparison of the solution chemistry and metal coupon corrosion patterns for the recycled and factory filled coolants is presented and discussed. S. 1110, the Engine Coolant and Antifreeze Bittering Agent Act of 2005 : hearing before the Subcommittee on Consumer Affairs, Product Safety, and Insurance of the Committee on Commerce, Science, and Transportation, United States Senate, One Hundred Ninth Congress, first session, July 18, 2005. Methods and equipment for engine coolant testing are described covering some of the newer standard procedures and proposed additions to the tests used. Methods and equipment gradually evolve according to the needs of the automotive industry. A continuous process is involved in design, safety, operator convenience and test requirements. The ASTM D 4340 test equipment with improvements is discussed. The ASTM D 3147 stop leak test has been substantially revised and updated. A new hot surface scale deposit test procedure and equipment are presented. The ASTM D 2809 test is reviewed with commentary on the current test procedure. Simulated service testing for long-life coolants requires changes to the present D 2570 standard, with consideration of including a more dynamic test similar to European approaches. Recycling of used engine coolants containing ethylene glycol and other glycols would appear to be well established, particularly for reverse osmosis and nanofiltration membrane, electrodialysis, and distillation-based processes. Both literature and recycling facilities indicate success in employing these techniques. However, many recyclers, particularly those employing a single treatment technology, are not capable of producing recycled product meeting original equipment manufacturer (OEM) requirements for coolant, and these typically fall far short of approaching virgin (nonrecycled) coolant quality. In addition, some recycling facilities have produced and marketed product that led to coolant system damage and engine failure, either as a result of not sufficiently removing contaminants or inadequately reformulating with corrosion inhibitors and other additives. The danger of process upsets resulting in inadequate product is particularly high for those facilities that receive feeds with varying contaminant levels and coolants containing a range of corrosion inhibitors and additives (silicates, organic acids, etc.). However, no study to date has focused on a fundamental assessment of the separation characteristics and interactions of the various classes of coolant technologies with the commercially available reverse osmosis, nanofiltration, and electrodialysis ion exchange membranes typically seen in recycling operations. This study presents results of a comprehensive evaluation of the separation characteristics of a wide range of these membranes with a wide range of coolant types. In particular, the study examined production rate characteristics, inhibitor and other additive separation, and contaminant removal for reverse osmosis, nanofiltration, and electrodialysis. Residual inhibitors remaining in the recycled coolant are examined, with guidance provided on how these residuals might affect coolant reformulation and performance. Significant advances have been made in heavy duty diesel engine technology to meet increasingly stringent environmental regulations for emissions. Today's heavy duty diesel engines are being designed with lighter and softer metals, greater turbocharging, increased combustion controls, and new emission reduction equipment. The cooling systems contained in these vehicles are similarly being impacted by smaller designs, new cooling system configurations, and increased usage of lighter, softer metals. Vehicle thermal loads have significantly increased due to increased power densities, higher engine temperatures, and greater metal-coolant fluxes which places greater emphasis on oxidation/thermal stability, and high temperature corrosion protection performance of the coolant. Other operating conditions (coolant flow rates, turbulence, pressure drops, deaeration) are also becoming more severe calling for improved erosion-corrosion protection, cavitation protection, and elastomer, seal, hose compatibility. This paper reviews the changes in heavy duty diesel engine technology and provides information on coolant performance in 2002-4 emission compliant engines. Predictions are also made on future engine technology and next generation engine coolants. Annotation Emerging from a November 1991 symposium in Scottsdale, Arizona, 19 papers report on advances in developing, testing, and applying engine cooling fluids for automobiles and heavy duty engines. Among the topics are carboxylic acids as corrosion inhibitors in engine coolant, phosphate-molybdate supplements to heavy duty diesel engines, the toxicity and disposal of engine coolants, and the characterization of used engine coolant by statistical analysis. Annotation copyright by Book News, Inc., Portland, OR. Many procedures exist worldwide to develop and to approve coolants for internal combustion engines. This paper discusses the aspects and types of coolant testing in general and the recent development of new test procedures in Europe. The work of the German coolant group is discussed in detail because they are completely revising the well known FVV Test R443/1986, which is the most important test for German car manufacturers. S. 1110, the Engine Coolant and Antifreeze Bittering Agent Act of 2005: hearing before the Subcommittee on Consumer Affairs, Product Safety, and Insurance of the Committee on Commerce, Science, and Transportation, United States Senate, One Hundred Ninth Congress, first session, July 18, 2005. Technical training and reference for anti-freeze and anti-corrosion engine coolants. Discusses: The thermal, physical and chemical considerations of water, ethylene and propylene glycols and glycol/water solutions. The corrosion mechanisms of the metals in the cooling system. Corrosion cells, galvanics, electrolysis, pitting, caviatation, impingement, crevice and solder bloom corrosion. Corrosion inhibition mechanisms. Inorganic, organic acid and hybrid inhibitors.Types of coolant, ASTM standards,list or registered coolants.Waste stream of drained coolants, toxicity, recycled coolants and processes, legislation. Coolant testing, pH, concentration. This volume consists of 14 manuscripts from the Fifth International Symposium on Engine Coolant Technology sponsored by the American Society for Testing and Materials Committee D15 on Engine Coolants, held in Toronto, Canada, in May 2006. Papers cover advances in system components, experimental testing, uses, and users' experience of automotive and heavy-duty applications. They focus on international coolant development, field testing of additives, recycling, additive compatibility, alternate coolant base technology, extended life oxidation and thermal stability, and new testing methods of cavitation, erosion, and localized corrosion. Contributors are international technical representatives from OEM and engine coolant producers. There is no index. A method for testing engine coolants using static vehicles is described. Tests were conducted with engines idling at the speed equivalent to 97 kph (60 mph) with an operating cycle of 16 h on and 8 h off for 161 000 simulated service kilometres (100 000 miles). The initial antifreeze coolant concentration was 45 percent with ASTM corrosive water for approximately 8000 simulated kilometres (5000 miles) in order to duplicate the original coolant fill condition at the vehicle assembly plant and allow sufficient period for film forming inhibitors to react with the internal multimetal surfaces. The initial coolant concentration was then cut in half to simulate a depleted coolant condition and accelerate the corrosion activity in the engine cooling system. Since the 1950s, the most common choice of engine coolant has been a 50:50 mixture of ethylene glycol and water, with the ethylene glycol containing selected corrosion inhibitors and other additives such as nitrates, silicates, borates, phosphates, tolyltriazole (TTZ), mercaptobenzothiazole (MET), antifoam, molybdates, silicones, dye, surfactant, and alkalinity builder. Manufacturers in Europe and Asia use a different corrosion inhibition technology than those used in North America. Collection of papers from the 2001 SAE World Congress, held March 5-8 in Detroit, Michigan. Paper topics are: a round robin study of freezing point of coolants using manual and automatic methods; a new tool for corrosion inhibitor research; elastomer service life prediction in organic acid coolants; the effects of contaminated engine coolants on the service life of elastomers; standard test method for cavitation and erosion-corrosion characteristics of aluminum pumps with engine coolants; a chemical base for engine coolant/antifreeze with improved thermal stability properties; the role of carboxylate-based coolants in cast iron corrosion protection; and heat exchange characteristics of silicate and carboxylate-based coolants in air-cooled engine parts. Through numerous line sketches and 150 photos, readers will find it easy to learn and understand the way the parts function in a cooling system. Also included are tech tips and simple project ideas that will help readers identify and solve their cooling system problems, or perhaps build a cooling system from scratch. High temperature, short term immersion testing was used to determine the impact of propylene and ethylene glycol base coolants on the physical properties of a variety of elastomeric and thermoplastic materials found in automotive cooling systems. The materials tested are typically used in cooling system hoses, radiator end tanks, and water pump seals. Traditional phosphate or borate-buffered silicated coolants as well as extended-life organic acid formulations were included. A modified ASTM protocol was used to carry out the testing both in our labora-tory and at an independent testing facility. Post-test fluid chemistry including an analysis of any solids which may have formed is also reported. Coolant impact on elastomer integrity as well as elastomer-induced changes in fluid chemistry were found to be independent of the coolant's glycol base. The ultimate guide to engine cooling systems for peak performance.Covers basic theory and modifications; individual components such as water pump, radiator, and thermostatic control systems; and information on designing a cooling system. This paper presents the history of the development of self-contained, mobile, high-volume, engine coolant recycling by reverse osmosis (R/O). It explains the motivations, created by government regulatory agencies, to minimize the liability of waste generators who produce waste engine coolant by providing an engine coolant recycling service at the customer's location. Recycling the used engine coolant at the point of origin minimizes the generators' exposure to documentation requirements, liability, and financial burdens by greatly reducing the volume of used coolant that must be hauled from the generator's property. It describes the inherent diffculties of recycling such a highly contaminated, inconsistent input stream, such as used engine coolant, by reverse osmosis. The paper reports how the difficulties were addressed, and documents the state of the art in mobile R/O technology. Reverse osmosis provides a purified intermediate fluid that is reinhibited for use in automotive cooling systems. The paper offers a review of experiences in various automotive applications, including light-duty, medium-duty and heavy-duty vehicles operating on many types of fuel. The authors conclude that mobile embodiments of R/O coolant recycling technology provide finished coolants that perform equivalently to new coolants as demonstrated by their ability to protect vehicles from freezing, corrosion damage, and other cooling system related problems. Auto Repair For Dummies, 2nd Edition (9781119543619) was previously published as Auto Repair For Dummies, 2nd Edition (9780764599026). While this version features a new Dummies cover and design, the content is the same as the prior release and should not be considered a new or updated product. The top-selling auto repair guide--400,000 copies sold--now extensively reorganized and updated Forty-eight percent of U.S. households perform at least some automobile maintenance on their own, with women now accounting for one third of this $34 billion automotive do-it-yourself market. For new or would-be do-it-yourself mechanics, this illustrated how-to guide has long been a must and now it's even better. A complete reorganization now puts relevant repair and maintenance information directly after each automotive system overview, making it much easier to find hands-on fix-it instructions. Author Deanna Sclar has updated systems and repair information throughout, eliminating discussions of carburetors and adding coverage of hybrid and alternative fuel vehicles. She's also revised schedules for tune-ups and oil changes, included driving tips that can save on maintenance and repair costs, and added new advice on troubleshooting problems and determining when to call in a professional mechanic. For anyone who wants to save money on car repairs and maintenance, this book is the place to start. Deanna Sclar (Long Beach, CA), an acclaimed auto repair expert and consumer advocate, has contributed to the Los Angeles Times and has been interviewed on the Today show, NBC Nightly News, and other television programs.