Subject Index

A

Acid number, 192 Acid subfractions, composition, 55(table), 56-57(figs) Acidic metabolites as cause of tank corrosion, 15 Acids and bases, subfractionation, 50-51 Additives anti-icing corrosion, 95, 98 effect on color stability, 108-109(figs) to control microbial growth, 10-11 to prevent formationism, 107-113 treatment program, 161-163, 176-177 Aeration, water, 10 Aerobic bacteria and fungi in fuel tanks, 16-17(figs) Aerobic destrose utilization testing, 19 Aging of fuels, 51-53(tables), 59-61, 103 Aging test technique, 49 Air as a fuel system contaminant increases oxidation of fuel, 1, 82 Air and water provide media for microbial growth in fuel tanks, 16-17 Amine-type antioxidants, 110 Amorphotheca (Cladosporium) resinae, 6-8, 11 Anaerobic dextrose utilization testing, 19 Analytical methods for fuel system contamination, 37-47 Analytical methods in microbiological contamination, 27-36 Analytical techniques, panel discussion, 184 Analytical testing in DFC quality assurance program, 115 Anti-icing additives, 10-11, 98, 105 Antioxidants in distillate fuels, 105-111 Arginine dihydrolase activity testing, 19 Aspergillus fumigatus, 96 ASTM Committees E-35, 15, 101, 103 ASTM Standards D-86, 168(table), 188(table) D-93, 168(table), 188(table) D-97, 168(table), 188(table) D-130, 188(table)

D-240, 168(table) D-381, 187, 190(table) D-445, 168(table), 188(table) D-482, 188(table) D-524, 188(table) D-613, 188(table) D-664, 109, 113 D-974, 188(table), 190(table), 192 D-975, viii, 141-143, 163, 165, 186-187 D-1298, 168(table), 188(table) D-1319, 108 D-1500, 109 D-1552, 188(table) D-1655, 23, 24 D-1660, 143 D-1796, 120, 127, 188(table) D-2274, 143, 188(table), 190(table), 192 D-2276, 127, 188(table), 190(table), 192 D-2500, 188(table) D-3241, 110, 192 D-3242, 190(table), 192 D-3948, 193 D-4054, 101 D-4057, 117 D-4176, 188(table), 190(table), 192, 193 D-4625, 191 E-979, 100 ASTM Proposed specification for gas turbine fuels, Annual book of standards, 1966, part 17, appendix 3(table 1), 167 STP 751, viii, 191 Auto-oxidation in gum formation, 83 Aviation fuel handling system, 15 Aviation gasoline on naval aircraft carriers-fuel contamination, 6–7

Azaarene compounds, 59

B

Bacteria, 6, 10–11, 15–17(figs), 23–25, 96 Bacteria contamination in diesel fuel systems, reference material for identification, 39(table) Bacterial growth in fuel, 146 Bacterial treatment in storage tanks, 10–11, 15, 23-25 Benomyl, 11 Biocide activity in diesel fuel, 98(table) Biocide additives, 161, 167, 176-177 Biocide efficacy program, 95–103 Biocide efficacy trials, 31 Biocide evaluation hydrolysis, 98 methodologies, 95-96, 100(figs), 101-103 triazine test methods, 96, 98, 101 Biocide treated cultures, 31(table) Biocide treatment, 146-150(tables) Biocides, 28-29 Biocides for bacterial treatment in storage tanks, 6, 10-11, 15, 23-27 **Biological contamination**, 88 Biological slime, 84, 88 Biomass estimation, 27 Black mat deposits, 158 Bottom-water drainage in distillate fuel storage, 95 Bushnell-Haas media-technique for measuring fuel contamination, 19

С

- C_0-C_3 phenanthrenes, 54
- C. resinae. See Cladosporium (Hormoconis) resinae, Cladosporium resinae
- Calcium emission in fuel analysis testing, 64, 65(table)
- Canadian naval fuel tanks, 28
- Candida. See Yarrowia lipolytica
- Candida in seawater diesel fuel, 8
- Candida tropicalis, 96, 101
- Carbazoles, 53, 61
- Carbon monoxide FTP emissions testing, 66, 75(fig)
- Catalytic cracking, 48
- Catalytic light cycle oils, 108
- Centrifugation/filtration, 120–123, 124– 126(figs), 129–133
- Centrifuging/coalescer filter unit, 123, 128, 129(fig)
- Characterization of microbial growth, 17(fig)
- Chemical properties of fuel, 48, 49(table)
- Chemical treatment, 119, 121, 129–133, 147, 161
- Chemistry of deposit/color/sediment formation, 107
- Chromatographic fractions and blends upon aging and color change/sediments formed, 52-54(tables)

- Citrate utilization testing, 19
- Cladosporium (Hormoconis) resinae, 21
- Cladosporium resinae, 7, 30–31(table), 44, 96–103
- Clay filtration, 147
- Cleaning, 119, 146-147
- Cleaning diesel fuel storage tanks, 152, 155, 158
- Cleanliness, 114, 188(table), 190(table), 192-193
- Cleanliness research, panel discussion, 84
- Climate factor in storage, 98
- Climatic conditions, 120–123(tables), 134–135
- CO. See Carbon monoxide
- Coalescer unit, 123, 128-130
- Coalescing, 147
- Coking, injector, 63-64
- Cold idle noise, 63
- Cold weather fuel characteristics, 1
- Color changes and sediment formation in fuels, 48, 49-52(tables), 61-62
- Color degradation, 159
- Color stability—effect of additives, 108– 109(figs)
- Colorbodies formation, sediment and thermal deposits—additives for prevention, 105, 107
- Conductivity improvers, 105
- Container contaminants, reference materials, 39(table)
- Contaminant analysis, sample preparation, 44-45(tables)
- Contaminant identification, 37, 42, 88
- Contaminated fuel storage systems analytical methods, 27-36
- Contamination
 - measurement, 19
 - microbiological, 27, 84
 - of diesel fuel, 39(table), 82, 159, 193
 - of fuel in storage, 1-5, 6, 18-19, 39
- of fuels, 105–113, 133–134, 146
- Copper emissions testing, 64, 65(table)
- Copper salts in diesel fuel, 160
- Corrosion in fuel tanks, 3-4, 15, 161
- Corrosion inhibitors, 95, 105
- Corrosion protection additives, 95
- Cost effectiveness, 148

D

- Deactivators, 105-111
- Debris in fuel tanks, 169–170, 192(table)
- Decontamination of distillate fuels, 95
- Defense Fuel Supply Center's (DFSC) Quality Assurance Program, 114–118

Degradation products in diesel fuels, 160 nitrogen, 82 oxygen, 82 sulfur, 82 Desulfovibrio implicated in corrosion, 96 Detergents, 105 Deterioration of stored fuel, 135 treatment program for prevention, 160 Dextrose utilization testing, 19 DFSC. See Defense Fuel Supply Center Dibutylphenylene diamine-use to inhibit gum formation, 83 Diesel emissions, 63 Diesel fuel additives, 163, 167 biocide additives, 98(table) contamination, panel discussion, 183, 186-187 gum effect on filter plugging, 68 preventive maintenance program, 157 properties and specification limits, 188(table) stability and cleanliness, 190(table), panel discussion, 185, 186(table) storage, 158 tanks, 159 Diesel fuel contamination color change, 48, 61-62emissions, 63 filtration, 86 gum, 82-84 oxidation, 1, 63-69, 83 stability, 63, 83 storage, 119, 135-139, 157 system contaminants, 38, 39(table) tanks, 134–137(tables) Diesel fuels, no. 2 properties and specification limits, 188(table) Diethylene glycol monomethyl ether used as substitute for EGME, 11 Dioxaborinane, 11 Distillate fuel contamination, panel discussion, 183, 186-187 properties and specification limits, 188(table) quality, 1 quality program for long-term storage, 167-181 stability, panel discussion, 185, 186(table) storage tank, 16(fig) Distillate fuels, 15, 27, 48, 105

Distillate fuels—microbial levels, 97(table) Drainage of water in fuel handling systems, 23 Driveability, 63 Dust and dirt contamination, identification, 42 Dyes, 105

Е

Efficacy program—biocides, 98(table) EGME. See Ethylene glycol monoethyl ether Elastomers-effect of hydroperoxides, 105 Electron microscopy, 38 Emergency fuel quality, 140-141 Emergency power systems, 139 Emergency storage of diesel fuels, 139 Emission spectroscopy, 64 Emission testing, 64, 74 Emulsion, 119 Environmental conditions-effect on longterm fuel storage, 119 Environmental effects on fuel contamination, 1 Ethylene glycol monomethyl ether (EGME) anti-icing additive in military jet fuels to control microbial growth, 10-11, 98 Ethyltriazine, 103

F

Federal Test Procedure (FTP) emissions testing, 75-79(figs) test vehical preparation, 64-67 Filler inlet for underground tanks, 136 Filter cakes, 91–92 Filter clogging, 157–158, 160 Filter/coalescer residue, 22 Filter plugging, 4, 7, 15, 37, 130-131, 146-147 effect of gum, 88-89 fuel samples, 84(table) in diesel fuels, 37, 83-84, 160-161 in fuel handling systems, 15 in injector coking vehicle, 63, 67, 68–72(figs) in naval fuel, 7 with contaminated fuels, 84 Filtration, centrifugation, 120–133 Filtration of diesel fuels, 86(fig) Floats in fuel storage tanks, 169, 170(fig) Fluorenones, 57–58(figs) Florida Power and Light fuel quality program, 167-182 Flow tests of fuel injectors, 70(table)

FTP. See Federal Test Procedure Fuel aging, 51-53(table), 59-61 Fuel analysis, 65(table) Fuel analysis, gas turbine, 171, 172-175(tables) Fuel chemistry, 107 Fuel cleaning, 120 Fuel contaminants, 160-161 Fuel contamination, 2, 105-113, 134-135(tables), 146 Fuel contamination measurement, 19 Fuel deterioration, 96, 105–107, 135 Fuel economy, 66, 74 Fuel emissions, 64, 74 Fuel filter clogging, 157-158 elements, 159-161 media, reference materials for identification, 39(table), 42 plugging, 37 Fuel gage malfunction caused by microbial growth, 16 Fuel handling systems design, 23 Fuel filter plugging in injector coking vehicle, 63, 67-68, 69(fig) Fuel filters, 15, 37, 63 Fuel gum, 63 Fuel injectors—flow tests, 70(table) Fuel oxidation, 54, 158 Fuel quality aging of navy distillate fuels, 49, 50(fig), 61 cold idle noise, 63 container and surface contaminants, reference materials for identification. 39(table) contaminants, 1-3(figs), 6, 37, 38(fig), 39(table) contaminants, method of sample measurement, 18-19 degradation in tanks, 82 effects of catalytic cracking, 48 effects of lower quality crudes, 48 emissions, 63 filter plugging, 63 fuel gum, 63, 83 physical and chemical properties, 49(table) physical changes aging of fuel, 48-53, 59-61 chemical composition, 49(table) color development, 48-52, 61-62 increase in viscosity, 49 sediment formation, 48-62 quality program, 167-182

sequential extraction and drying (TAMI), 19 - 20thermogravimetric analysis (TGA), 19–20 Fuel quality program, 167–182 Fuel rotation program for preventive maintenance, 181 Fuel sampling program for preventive maintenance, 181 Fuel-soluble biocides, 11 Fuel stability, 119, 167 Fuel stability and cleanliness research panel discussion, 184-185, 188(table), 189(fig) Fuel stability—effect on injector coking, 63– 64 Fuel storage, 95-103, 158 Fuel storage facilities, 1 Fuel storage management, 119, 134–138, 148– 149 Fuel suction boom, 169 Fuel system contaminants, reference materials, 38, 39-40(tables), 42 design, 161 emergency power for nuclear power plants, 140(fig) failure, 161 quality assurance program, 140-141 Fuel system treatment program, 167 Fuel tank, 27 Fuel thief, 120 Fuel treatment biocides, 148–150(tables), 151(fig) Fuels, 114 Fungi, 96, 103, 146 Fungi contamination in aircraft and naval fuel supplies, 27 in diesel fuel systems, reference materials for identification, 39(table) in fuel tanks, 16–17(figs) in jet fuel, 7-8, 16-17 in shipboard fuel tanks, 28 laboratory analytical methods, 35

Fungicides, 111

G

 GC/MS analysis. See Gas chromatography/ mass spectroscopy
 Gas chromatography/mass spectroscopy (GC/ MS) analysis, 51-53
 Gas turbine distillate fuel quality control program for long-term storage, 167 fuel analysis, 171, 172–175(tables) liquid fuel specification, 168(table) Gasoline, naval vessels, 6–7, 28 Georgia Power Company preventive maintenance program for diesel fuel, 157–266 Gum formation in diesel fuels, 84–89, 87(fig) in gas turbines, 160 treatment, 83 Gum and particulate formation increased by water aeration, 10

Gum solvent-effect on flow, 68

Н

- HPLC. See High performance liquid chromatography
- High performance liquid chromatography, 54
- High resolution mass spectrometry results for aged and unaged fuel samples, 61
- Hormoconis. See Cladosporium (Hormonis) resinae

Housekeeping practices in fuel storage, 2, 7

- Housekeeping quality in fuel handling systems, 15, 23, 146
- HUM-bugs. See Hydrocarbon utilizing microorganisms
- Humidity, 123(table)
- Hydraulic oil and seawater mixture effect of long-term contact, 99(table)
- Hydrocarbon utilizing microorganisms, 95, 159, 193

Hydrocarbons in FTP emissions testing, 66 Hydrogen sulfide odor

implies presence of sulfate reducing bacteria (SRB), 96

Hydrogen sulfide production testing, 19

Hydrolysis, 98

Hydroperoxides, 54, 105

I

Icing. See Anti-icing additives

- Identification of fuel system contaminants, method, 39-40(tables), 41
- Identification of microbial growth, 17(fig)
- Incompatibility of refinery components, 110
- Indole production testing, 19, 53
- Infrared spectroscopy, 38
- Injector coking—flow capacity, 69–71(table)
- Injector coking vehicle performance
 - effect of unstable diesel fuel, 63-64, 66, 69

Injector deposits, 73(tables), 74 Injector nozzles—plugging and clogging, 161 Inorganic compounds, nonmetallic reference materials for identification, 39(table) Inspection system, 116 Instability of refinery components, 110 Iron emission tests, 64, 65(table) Isothiazolones, 11

J

Jet fuels, microbiological contamination, 16– 17

K

Kerosene fuels, 105, 137, 141 Kerosene fungus, 7

L

- Laboratory analytical methods for sampling contamination in fuel tanks, 27–36
- Laboratory procedures for identifying microbial growth, 15-25
- LCO. See Light cycle oils
- Lead emissions in fuel analysis
- Leopard spots, 22
- Light cycle oils (LCO), 108
- Liquid chromatography, 54
- Long-term storage of fuel, 99, 119, 139-144
- Long-term storage of diesel fuel, 163, 167

Μ

- Malfunction of fuel gage caused by microbial growth, 16
- Marine sediments, contamination, 6
- MBC survey—sampling procurement, appendix, 34
- Metabolites, acidic, 15
- Metal contaminants in diesel fuel, reference materials for identification, 39(table), 42
- Metal deactivators, 105
- Methane gas, microbially produced, 6
- Methodologies for biocide evaluation, 95– 96, 100–103
- Methodology for identification of contaminants, 37
- Microbial activity, 157-158
- Microbial analysis, 171(fig), 176–178(figs)
- Microbial contamination
 - gas turbine fuel analysis, 171(fig), 172-175(tables)

Microbial contamination—Continued in middle distillate and kerosine fuels, 105 of diesel fuel, 161 of fuels, 146, 157-158 of gas turbine distillate fuel, 167 Microbial deterioration of fuels biocide testing, 101 Microbial fuel contamination diesel systems, reference materials for identification, 43 jet fuels, 16–17(figs) marine sediments, 2-8, 9(fig) naval vessels, 28 shipboard tanks, 28 Microbial growth acidic metabolites as catalyst for corrosion of tank bottoms, 15 control methods, 23 in aviation fuel tanks, 16–17(figs) in fuel storage, 99 types of contamination, 16 Microbial growth problems in aviation gasoline fuel gage malfunction in aircraft wing tanks, 15 fungus growing on fuel probe, 15 Microbial sludge build-up, 161, 170(fig), 180(fig)Microbiological contamination, 27, 193–194 Microbiological deterioration of fuels biocide testing, 96, 101 Microbiological slime, 84-89 Microbiological techniques, 44 Microorganisms in water, 6 Microscopic techniques for identifying fuel system contaminants, 40(table) Middle distillate fuels, 105 Middle distillate stabilizers, 110-111 Morpholine effect on microbial growth, 99(fig)

N

- Naval vessels, fuel contamination, 28
- Navy distillate fuels, 48-62
- Nitrogen compounds, 57, 59
- Nitrogen-in gum, 83
- Nitrogen gas production testing, 19
- Nitrogen removal by hydrogen treating, 106
- Nitrous oxides FTP emissions testing, 66, 74– 75(figs)
- Noise levels in passenger compartment, 78-80
- Nonmetallic inorganic compounds, reference materials for identification, 39(table)

NO_x. See Nitrous oxide Nuclear power plants, 139, 144

0

- Oil-seawater mixture, 99 Oil/water interface with sediment, 170(fig) Olefin content as a cause of poor fuel stability, 64, 65(table) Optical microscopy, 38 Organic compounds in diesel fuel systems, reference materials for identification, 39(table) Organo-boron compounds as fuel-soluble biocides, 11 Ottowa sand, 20 Oxi/Ferm Tube (Roche) for identification of bacterial isolates, 19 Oxidation, 107, 110-113, 133, 157-158 Oxidation in diesel fuels, 83 Oxidation in injector coking vehicle performance, 63 Oxidation in navy distillate fuels, 48, 52-54, 82 Oxidation stability of distillate fuel oil, 143 Oxidative/thermal stability, 190
- Oxygen-in gum, 83

P

- P. aeruginosa. See Pseudomonas aeruginosa Panel discussion
- distillate fuel contamination, 183-198
- Particulate formation, 110
- Particulates, 192(table), 193
- Passenger compartment noise levels—FTP emissions testing, 78-80(figs)
- Peroxide formation, 105-106, 113
- Petroleum-quality representative, 115
- pH as means of controlling fuel corrosiveness avoids use of toxic compounds, 10
- Phenanthrenes, C₀-C₃, 54
- Phenylenediamide antioxidants, 106
- Physical properties of fuel, 48-49(table)
- Plugging of fuel filters
 - by fuel system contaminants, 37, 157 in fuel handling systems, 15, 84, 160–161, 169
 - in injector coking vehicles, 63-69
- Polymerization, 83
- Potassium tellurite for recovery of cladosporium resinae, 101(table)
- Power plant quality control program for fuel storage, 141

Preservation of distillate fuels in storage, 95 Prevention of microbial growth, 15 Preventive maintenance for fuel stability, 156-157, 161-162, 181 Product identification, 141(table) Product quality, 115 Protein analysis in microbiological contamination, 29-30(table), 35 Pseudomonas, 21, 23, 96, 98 Pseudomonas aeruginosa, 30–31(table), 44, 96 Pseudomonas putida, 98 Pseudomonas species for biocide investigation p. aeruginosa, 96 p. putida, 98 Purification—long-term diesel fuel storage. 119 Purifier centrifuge/filter unit, 120, 127-128 Purifier filter, 133 Pyridine, 59 Pyridinethiols-toxic to marine life, 11 Pyrrolic benzolog family, carbazoles less active than indoles in sediment formation, 61

Q

QR. See Quality representative Quality assurance program, 114–118 Quality control, 114–115, 139 Quality representative (DFSC), 115–118

R

- RCRA. See Resource Conservation and Recovery Act
- Reference materials for fuel system contaminants, identification, 38, 39-40(tables), 42
- Refinery components, incompatibility partly caused by solvent effects, 110
- Reliability of material, 114–115
- Reproducibility of test method, 145
- Resource Conservation and Recovery Act (RCRA1), 1

S

- Sample analysis of fuel sludge, 20–21(figs) Sample measurement, contaminants, 18–19 Sampling
 - for preventive maintenance of fuel, 181

laboratory analytical methods MBC survey—sampling procurement, appendix, 34 on shipboard fuel tanks, 27-36 sample preparation techniques for diesel fuel analysis, 38-46 Sampling and testing, 120, 123-127(figs) Scanning electron microscopy (SEM) to identify contaminants in diesel fuel systems, 39, 89-93(figs) Seawater intrusion in shipboard fuel tanks, 8, 28 Seawater-oil mixture, 99 Sediment composition characterization, 19-20(table) drying, 19 in fuel tanks, 170(fig) sequential extraction, 19 Sediment contamination in filter plugging, 84 - 85Sediment deposits, 105, 107 Sediment formation in navy distillate fuels, 2-9, 16-17, 28, 43, 48 - 62Sediment samples, relative intensities from high resolution mass spectrum, 60(table) Sedimentation, 108–109(figs), 112(fig) Sediments in fuel samples, 90(fig) SEM. See Scanning electron microscope Shipboard tanks, microbiological contamination, 28 Silica gel filtration-effect on stabilizer additives, 110(table) Slime, 146 Slime and debris in diesel fuels, 84-88 Slimes, 6, 84, 88 Sludge in fuel tanks, sample analysis, 20-21(figs)Society for Industrial Biology, 96 Soluble protein method for fungi in fuel, appendix, 35 Spectroscopic techniques for identifying fuel system contaminants, 38, 40(table) SRB. See Sulfate reducing bacteria Stability characteristics of fuels, 1, 63-64, 157 Stability effects of additives, 110(table) of anti-oxidants, 112–113(table) Stability properties of diesel fuels, 160, 190(table) Stability samples after biocide treatment, 177,

178 - 180(figs)

Stability test techniques, DOE literature search, 191 Stability tests on diesel fuels, 159 Stability treatment, 167 Stabilizers, middle distillate, 110-111 Standards and Specifications. See also ASTM DuPont F21 accelerated stability test, 159 General Electric GEI-41017F, 167, 168(table, ftn) Society for Industrial Biology SIM SP-2, 96 US DF-2, 115 F-76, 115 JP-4, 106, 115 JP-5, 106, 115 JP-8, 115 MIL-S-53021, 96, 167, 176–177, 181 MIL-T-5624, 106-107 VV-F-800D, 187, 188(table), 192 Storage diesel fuels, 119, 135-139 hydraulic oils for offshore use, 98–99(table) long-term, of diesel fuels, 163 microbial control of hydraulic oil for offshore use, 98–99(table) preservation of distillate fuels, 95 system design, 137 Storage tanks biocide treatment, 10-11, 15, 23-25, 148, 151 - 154cleaning, 152, 155, 158 construction, 167-168 design, 3(figs) distillate fuel, 16(fig) filter plugging, 169 fuel suction boom, 169 preventive maintenance, 169-181 sludge, 169(fig) stability testing, 159 Subfractionation of acids and bases, 50-51, 53-55(tables), 59 Suction boom, 169 Sulfate-reducing bacteria, 6-8, 15 Sulfate-reducing bacteria in presence of hydrogen sulfide odor, 96 Sulfides—anaerobic generation, 10 Sulfur compound stability, 193 in fuel emissions testing, 64, 65(table) in stored oil, 6, 82 removal by hydrogen treating, 96 Surfactant metabolites-effect on filter/separators, 15

Surveillance program for diesel fuel in longterm storage, 143–145

Т

TABAD. See Tertiary butylamine pyridine Tank cleaning, 152–158 Tank corrosion, 15 Tank sampling for biomass estimation, laboratory analytical methods, 27 Tank sediment housekeeping procedures, 21-28 sample analysis, 20–23(figs) test procedures, 64-67, 75-79 Tank vents, 136 Tankers, 114, 116-117 Tanks, whole fuel storage, 148 Temperature, 121–122(tables) Tertiary butylamine pyridine N-oxide (TA-BAO). 103 Test method for evaluation of biocides, 96, 101 Test vehicle preparation, 64-66 Testing fuels in long-term storage, 145 TGA. See Thermogravimetric analysis Thermal deposits, 105–110, 113 Thermal stability of aviation turbine fuels, 143 Thermogravimetric analysis (TGA), 19-20 Time factor in storage, 98 Training, 114 Transort of bulk petroleum, 115 Treatment, fuel and water soluble biocides, 146 Treatment off-shore, 153-154 Treatment onshore, 151–153 Treatment programs analysis, 162(table) biocide additives, 161-163, 176-177 for fuel stability, 157 monitoring, 177 to prevent diesel fuel deterioration, 160 Triazine biocide, 98(table)

U

Underground storage, 1 Underground tanks, 135–137 United States Standards. See Standards and specifications Unstable diesel fuel effect on injector coking vehicle performance, 63, 79 testing, 64 Urease activity testing, 19 User specification limits diesel fuel stability and cleanliness properties, 190(table)

V

Vacuum pump, 124(fig)
Vehicle performance, injector coking problems, 63, 74
Vehicle preparation for testing, 64–66
Vent pipe inlets, 137
Vents, 136
VGO. See Virgin gas oils
Virgin gas oils, 108–109(figs)

W

Water aeration, 10 Water as a fuel contaminant cause of corrosion and fuel degradation, 2, 7-12 diesel fuels, 160, 169 effect on diesel fuel gum, 10, 90-91(figs), 93(table) elimination from fuel handling systems, 17 in fuel tanks, 146 Water-bottoms biocide treatment, 24(fig), 148–150(tables) Water drainage in fuelhandling systems, 23 Water haze, 193 Wind speed, 123(table)

X

X-ray fluorescence spectroscopy (EDXRF), 38-39 Xylose utilization testing, 19

Y

Y. lipolytica. See Yarrowia lipolytica
Yarrowia lipolytica (formerly Candida), 30–31(table), 44
Yeast, 146
Yeast contamination

in diesel fuel systems, reference materials
for identification, 39(table)
in shipboard tanks, 8, 28

Z

Zinc emissions in fuel analysis testing, 64, 65(table)