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Referências Bibliográficas

ADOMEIT, P. S.; PISCHINGER, M.; BECKER, H.; ROHS, A.; GREIS, Y. **Laser Optical Diagnostics and Numerical Analysis of HSDI Combustion Systems**. *THIESEL 2004: Conference on Thermo- and Fluid Dynamic Processes in Diesel Engines.* Valencia: Editorial de la UPV, pag. 331-340. 2004.

AKIHAMA, K.; TAKATORI, Y.; INAGAKI, K. **Mechanism of the Smokeless Rich Diesel Combustion by Reducing Temperature**. *SAE International, SAE Paper 2001-01-0655*, 2001.

ALPERSTEIN, M.; SWIM, W. B.; SCHWEITZER, P.; H. **Fumigation kills smoke - improves diesel performance**. *SAE International, SAE Paper 580058*, 1958.

AMORIM, R. J. **Combustión por Difusión de Baja Temperatura em Motores Diesel de Pequeña Cilindrada**. Tesis Doctoral, Departamento de Máquinas y Motores Termicos de la Universitat Politècnica de València, 2010.

AMAGAI, K.; HASHIMOTO, Y.; ARAI, M. **Ignition and combustion characteristics of two-stage injection diesel spray**. *Transactions of JSAE , Vol.20*, pp.401-411. 1999.

ANDREWS, A. S.; QUICK, G. R. **Fuel Substitution in Agriculture**. *N.S.W. Department of Agriculture, Agricultural Engineering Centre, Glenfield,N.S. W. 216 7 (Australia),*4 October 1984.

ASHLEY, S. **Dual Fuel lab engines achieve high efficiencies, low emissions**. Powertrain - Automotive Engineering International Online, Society of Automotive Engineers, 2010.

BANDEL, W. **A Review of The Possibilities of Using Alternative Fuels in Commercial Vehicle Engines**. Elsevier Science Publishers B.V., Resources and Conservation, 10 (1983) 135-160, Amsterdam, 1983.

BARNES, K.; KITTELSON, D.; MURPHY, T. **Effect of Alcohols as Supplemental Fuel for Turbocharged Diesel Engines.** SAE Technical Paper 750469, doi:10.4271/750469. 1975.

BENAJES, J.; MOLINA, S.; GARCÍA, J. M. **Influence of Pre and Post Injection on the Performance and Pollutant Emissions in a HD Diesel Engine.** *SAE Paper 2001-01-0526*. 2001.

BESSONETTE P. W.; SCHLEYER C. H.; DUFFY K. P.; HARDY, W. L.; LIECHTY, M. P. **Effects of fuel property changes on heavy-duty HCCI combustion.** SAE paper, pp. 01–0191, 2007.

BIPLAB, K.; SAHA, K.; NIRANJAN, S. **Effect of hydrogen-diesel quantity variation on brake thermal efficiency of a dual fuelled diesel engine.** Department of Mechanical Engineering, Indian Institute of Technology Guwahati, Assam, India, Journal of Power Technologies 92 (1) 55–67. 2012.

BROGIO, R. J. **Barreiras Internacionais ao Etanol Combustível**. Dissertação de Mestrado apresentada ao programa de Pós-graduação em Tecnologia de Processos Químicos e Bioquímicos, da Escola de Química da Universidade Federal do Rio de Janeiro, como parte dos requisitos necessários à obtenção do titulo de Mestre em Ciências. Rio de Janeiro, 2009.

BRUNEAUX, G. **Combustion structure of free and wall-impinging diesel jets by simultaneous laser-induced fluorescence of formaldehyde, poly-aromatic fluorescence of formaldehyde, poly-aromatic hydrocarbons, and hydroxide**. *International Journal of Engine Research*, SAE International, Vol 9, no. Nº 3, 249-265. 2008.

CHAPLIN, J.; JANIUS, R. B. **Ethanol fumigation of a compression-ignition engine using advanced injection of diesel fuel**. Transactions of the ASAE 30 (January-June): 610-614, 1987.

CHEN, T. **Diesel Engine Operation on Alcohol Fuels Using a Computer Controlled Fumigation Process**. A Thesis submitted in fulfillment of the requirement fot the Degree of Master of Enginnering (Mechanical) in the University of Caterbury, 1991.

CHEN, S. **Simultaneous Reduction of NOx and Particulate Emissions by Using Multiple Injections in a Small Diesel Engine**. SAE Paper 2000-01-3084. 2000.

CHEN, K. **An Investigation of the Processes During the Rapid Compression of Premixed fuel-Air Systems.** A Dissertation Submitted to the Faculty of graduate Studies in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy, Department of Mechanical and manufacturing Engineering, University of Calgary, Calgary, Alberta, September, 1999.

CHO, K.; CURRAN, S.; PRIKHODKO, V.; SLUDER, C.; PARKS, II. J.; WAGNER, R. **Experimental Investigation of Fuel-Reactivity Controlled Compression Ignition (RCCI) Combustion Mode in a Multi-cylinder, Light-Duty Diesel Engine.** 7°th US National Combustion Meeting Organized by the Eastern States Section of the Combustion Institute and Hosted by the Georgia Institute of Technology, Atlanta, GA, March 20-23, 2011.

CHRISTENSEN, M.; JOHANSSON, B. **Influence of mixture quality on homogeneous charge compression ignition**. SAE transactions, 107, pp. 948–960, 1998.

CORCIONE, F. E.; VAGLIECO, B. M.; CORCIONE, E. G.; LAVORGNA, M.; LANZAFAME, R. **Study of the combustion of a new small DI diesel engine with advanced common rail injection system**. JSAE/SAE International Spring Fuels & Lubricants Meeting,Yokohama, Japan, SAE paper 2003-01-1782. 2003.

CORDEIRO, C. T. **Modelagem Termodinâmica de um Motor do Ciclo Otto Tipo Flex-Fuel Funcionando com Gasolina, Àlcool e Gás Natural**. Dissertação de Mestrado, Programas de Pós-Graduação de Engenharia da Universidade Federal do Rio de Janeiro, Fevereiro, 2007.

CURRAN, S.; HANSON, R.; BARONE, T.; STOREY, J.; WAGNER, R. **Performance of Advanced Combustion Modes with Alternative Fuels: Reactivity Controlled Ignition Case Study**. Energy & Transportation Science Division Oak Ridge National Laboratory, CBES Forum, January 2012.

DA SILVA, R. E.; TÔRRES, B. R. **Thermpphysical Properties of Diesel/Biodiesel Blends**. 22nd International Congresso f Mechanical Engineering (COBEM 2013), November 3-7, Riberão Preto, SP, Brazil. 2013.

DE RUDDER, K. ***An approach to low temperature combustion in a small HSDI diesel engine***. Valencia: Tesis Doctoral - Departamento de Máquinas y Motores Térmicos - Universidad Politécnica de Valencia, 2007.

DEPARTAMENTO DE ENERGIA DOS EUA. **Performance of Advanced Combustion Modes with Alternative Fuels: Reactivity Controlled Compression Ignition Case Study**. Janeiro, 2012.

DIETRICH, W.; BINDEL, H. **O desenvolvimento da "injeção piloto" para uso de álcoois em motores ciclo Diesel**. Simpósio de Engenharia Automotiva e XI Encontro dos Centros de Apoio Tecnológico, Brasília, p. 515-533. 1983.

ECKLUND, E. E.; BECHTOLD, R. L.; TIMBARIO, T. J.; MCCALLUM, P. W. **State-of-the-Art Report on the Use of Alcohols in Diesel Engines**. SAE Paper 840118, 1984.

EGÚSQUIZA, C. J. C. **Avaliação Experimental de um Motor do Ciclo Diesel Operando no Modo Bicombustível: Diesel/Etanol e Diesel/Gás**. Ph.D thesis - Departamento de Engenharia Mecânica, Pontifical Catholic University of Rio de Janeiro, RJ - Brazil, 2011.

EHLESKOG, R. **The influence of multiple injections on combustion-an experimental investigation**. Göteborg: Chalmers University of Technology, Department of Applied Mechanics. 2007.

EHLESKOG, M. **Low Temperature Combustion in a Heavy Duty Diesel Engine**. Thesis for The Degree of Doctor of Philosophy in Termo and Fluid Dynamics, Department of Applied Mechanics Chalmers University of Technology, Gothemburg, Sweden. 2012.

ELLIOTT, J. A. **An Introduction to Sustainable Development: the developing world**. London & New York, Routledge. 1994

GARCIA, A. **Estudio de los efectos de la Post Inyección sobre el Proceso de Combustión y la formación de Hollín en Motores Diesel**.

Tesis Doctoral, Departamento de Máquinas y Motores Térmicos de la Universitat Politècnica de València, 2009.

GOLDENSTEIN, M.; AZEVEDO, S. L. R. **Combustíveis Alternativos e inovações no Setor Automotivo: Será o fim da Era do Petróleo.** BNDES Setorial, Rio de Janeiro, n. 23, p. 235-266, mar. 2006.

GRIFFITHS, J. F.; JIAO, Q.; KORDYLEWSKI, W.; SCHEIBER, M.; MEYER, J.; KNOCHE, K. F. **Experimental and Numerical Studies of Ditertiary Butyl Peroxide Combustion at High Pressure in a Rapid Compression Machine**. Combustion and Flame, Vol 93, pp. 303-315, 1993.

HAN, Z.; ULUDOGAN, A.; HAMPSON, G.; REITZ, R. **Mechanism of Soot and NOx Emissions Reduction Using Multiple Injections in a Diesel Engine**. SAE Paper 960633. 1996.

HALSTEAD, M. P.; KIRSH, L. J.; QUINN, C. P. **The Autoignition of Hydrocarbon Fuels at High Temperature and Pressure – Fitting of a Mathematical Model**. Combustion and Flame, Vol 30. Pp 45-60, 1977.

HANSON, R. M.; SPLITTER, D. A.; KOKJOHN, S. L.; REITZ, R. D. **An Experimental Investigation of Fuel Reactivity Controlled PCCI Combustion in a Heavy-Duty Engine**. SAE Technical Paper 2010-01-0864, 2010.

HARDENBERG, H.; SCHAEFER, J. A. **The use of Ethanol as a fuel for compression-ignition engines**. SAE Technical Paper 811211. 2011.

HARDY, W. L.; REITZ, R. D. **A study of the effects of high EGR, high equivalence ratio, and mixing time on emissions levels in a heavy-duty diesel engine for PCCI combustion**. SAE Technical Paper 2006-01-0026, doi:10.4271/2006-01-0026. 2006.

HASHIZUME, T.; MIYAMOTO, T.; AKAGAWA, H.; TSUJIMURA, T. **Emission Characteristics of a MULDIC Combustion Diesel Engine: Effects of EGR**. JSAE Review, pp 428-430, 1999.

HELMANTEL, A.; SOMHORST, J.; DENBRATT, I. **Visualization of the effects of post injection and swirl on the combustion process of a passenger car common rail DI diesel engine**. *ICES 2003-622. ASME*. 2003.

HEISLER, H. **Advanced Engine Technology**. ISBN.: 1-56091-734-2. 1995.

HEYWOOD, J. *Internal combustion engines fundamentals.* 1ª edición. McGraw-Hill Inc., 1988.

HIGGINS, B.; SIEBERS, D. **Measurement of the Flame Lift-Off Location on DI Diesel Sprays Using OH Chemiluminescence.** SAE International, SAE Paper 2001-01-0918, 2001.

HOLMÉR, E.; BERG, P.; BERTILSSON, B. **The Utilization of Alternative Fuels in a Diesel Engine Using Different Methods**. SAE Technical Paper 800544, doi:10.4271/800544. 1980.

HU, Z.; WU, Z.; LI, L.; GAO, G. **Spray Hot-impingement System Optimization for Premixed Diesel Homogeneous Charge Preparation**. SAE Technical Paper 2008-01-0014, doi:10.4271/2008-01-0014. 2008.

HUESTIS, E.; ERICKSON, P. A.; MUSCULUS, M. P. B. **In-Cylinder and Exhaust Soot in Low-Temperature Combustion Using a Wide-Range of EGR in a Heavy-Duty Diesel Engine**. *SAE International, SAE Paper 2007-01-4017*, pag 11. 2007.

INAGAKI, K.; FUYUTO, T.; NISHIKAWA, K.; NAKAKITA, K.; SAKATA, I. **Dual Fuel PCI combustion controlled by in-cylinder stratification of ignitability.** SAE Technical Paper 2006-01-0028, 2006.

IMARISIO, R.; ROSSI, G. M. **Potential of future common rail DI diesel engines.** Paper 20A2004, *Proc. Int. Symp.: The Future of Diesel Engine Technology for Passenger Cars*, Porto Cervo, Italy. 2000.

IMARISIO, R.; PETERS, B.; ROSSI, S.; PINSON, J.; BORETTO, G.; BURATTI, R. **Diesel strategies towards fuel neutral European emission standards.** Paper 04A5010, ATA Symposium, Bari, Italy. 2004.

JAYARAMAN, S. **Performance Optimization of a Diesel Engine for Dual Fuel Combustion.** A Thesis in Industrial Engineering Submitted in Partial Fulfillment of the Requirements for the Degree of Master Of Science, The Graduate School College of Engineering, The Penssylvania State University, 2012.

JOSEPH, J.; HENRY, R. **O Impacto do Protocolo de Quioto no Setor Automotivo.** Apresentação do III Fórum Sindipeças do Meio Ambiente, out. 2005.

KALGHATGI, G. T. **Auto-Ignition Quality of Practical Fuels and Implications for Fuel Requirements of Future SI and HCCI Engines.** SAE 2005-01-0239, 2005.

KAMIMOTO, T.; BAE, M. **High Combustion Temperature for the Reduction of Particulate in Diesel Engines.** *SAE Paper 880423*, 1988.

KANEKO, N.; ANDO, H.; OGAWA, H.; MIYAMOTO, N. **Expansion of the Operating Range with In-Cylinder Water Injection in a Premixed Charge Compression Ignition Engine.** *SAE International, SAE Paper 2002-01-1743*, 2002.

KITAMURA, T.; ITO, T.; SENDA, J.; FUJIMOTO, H. **Mechanism of smokeless diesel combustion with oxygenated fuel based on the dependence of the equivalence ratio and temperature on soot particle formation.** *International Journal of Engine Research Professional Engineering Publishing,* Vol. 03, nº 4, pag. 223-248. 2002.

KNECHT, W. **Diesel engine development in view of reduced emission standards**. Energy, Vol. 33 no 2, pp. 264{271, 2008.

KOKJOHN, S.; HANSON, R.; SPLITTER, D.; REITZ, R. **Experiments and Modeling of Dual Fuel HCCI and PCCI Combustion Using In-Cylinder Fuel.** Blending," *SAE Int. J. Engines* 2(2):24-39, doi:10.4271/2009-01-2647. 2010

KOKJOHN, S.; HANSON, R.; SPLITTER, D.; REITZ, R. **Experiments and Modeling of Dual Fuel HCCI and PCCI Combustion Using In-Cylinder Fuel**. Blending," *SAE Int. J. Engines* 2(2):24-39, doi:10.4271/2009-01-2647. 2010.

KOKJOHN, S. L.; HANSON, R. M.; SPLITTER, D. A.; REITZ, R. D. **Fuel reactivity controlled compression ignition (RCCI): a pathway to controlled high-efficiency clean combustion"**, International Journal of Engine Research, **12**(3), pp. 209–226. 2011.

KOKJOHN, S. L. **Reactivity Controlled Compression Ignition (RCCI) Combustion**. A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy (Mechanical Engineering) at the University of Wisconsin – Madison, 2012.

KÖNIGSSON, F. **Advancing the Limits of Dual Fuel Combustion.** Licentiate Thesis, Departament of Machine Design, Royal Institute of Technology, Stockholm, 2012.

KOOK, S.; BAE, C.; MILES, P.; PICKETT, L. **The influence of Charge Dilution and Injection Timing on Low-Temperature Diesel Combustion and Emissions.** *SAE International, SAE Paper 2005-01-3837*, 2005.

LARSEN, U.; JOHANSEN, T.; SCHRAMM, J. **Ethanol as a Fuel for Road Transportation.** Main Report" IEA (Interntationa Energy Agency), 2009.

LEWANDER, M. **Characterization and Control of Multi-Cylinder Partially Premixed Combustion**. Division of Combustion Engines Department of Energy Science, Lund University, May 2011.

LILIK, G. K. **Hydrogen Assisted Diesel Combustion.** Master's Thesis, Department of Energy and Mineral Engineering, the Pennsylvania State University. 2008.

LIM, J. H.; REITZ, R. **Improving High Efficiency Reactivity Controlled Compression Ignition Combustion with Diesel and Gasoline Direct Injection"**, Journal Automobile Engineering, 227(1) 17-30, 2012.

MEITJES, K.; ALKIDAS, A. C. **Experimental and Computational Investigation of the Flow in Diesel Prechambers.** SAE Paper 820275, 1982.

MISCHKE, A.; HARDENBERG, H.; SCHIIFER, A. **Aspekte alternativer Kraftstoffe fur Dieselmotoren**. Automobiltech. Z., 82: 12. 1980.

MOLINA, S. A. **Estudio de la influencia de los parámetros de inyección y la recirculación de gases de escape sobre el proceso de combustión, las prestaciones y las emisiones de un motor diesel de 1.8 litros de cilindrada.** Valencia: Tesis Doctoral E.T.S. Ingenieros Industriales. Universidad Politécnica de Valencia, 2003.

MOLLENHAUER, K.; TSCHOEKE, H. **Handbook of Diesel Engines.** Bosch, 2010.

MORALES, R.; STORPER, M. **Prospects for Alternative Fuel Vehicle Use and Production in Souther California: Environmental Quality and Economic Development.** Lewis Center for Regional Policy Studies, Working Paper No. 2, maio, 1991.

MUÑOZ, L. F. **Contribución al Estudio del Ruido de Combustión em Conceptos Avanzados de Combustión Diesel.** Tesis Doctora, Departamento de Máquinas y Motores Termicos de la Universitat Politècnica de València, 2013.

MURATA, Y.; NISHIO, Y.; KUSAKA, J.; DAISHO, Y.; KAWANO, D.; SUZUKI, H.; ISHI, H.; GOTO, Y. **Numerical analysis of miller-premixed charge compression ignition combustion on a dynamic phi-T map**. International Journal of Engine Research, Vol. 11 no 2, pp. 89-98, 2010.

MURAYAMA, T.; MIYAMOTO, N.; CHIKAHISA, T.; TANAKA, K. **Combustion and Performance in Diesel Engines with Carbureted Ethanol**. Hokkaido University, 1981.

NEHMER, D. A.; REITZ, R. D. **Measurement of the effect of injection rate and split injections on diesel engine soot and NOx emissions"**, SAE paper 940668. 1994.

NIJEWEME, D. J.; KOK, J. B. W.; STONE, C. R.; WYSZYNSKI, L. **Unsteady in-cylinder heat transfer in a spark ignition engine: experiments and modelling**. Proc. Instn. Mech. Engrs., vol. 215, part D, part D. pp. 747-760, 2001.

NOGUCHI, N.; TERAO, H.; SAKATA, C. **Performance Improvement by Control of Flow Rates and Diesel Injection Timing on Dual Fuel Engine with Ethanol.** Agricultural Engineering Department, Hokkaido University, Kita-9, sishi-9, Kita-ku, Sapporo 060 Japan. 1996.

OJEDA, W.; ZOLDAK, P.; ESPINOSA, R.; KUMAR, R. **Development of a fuel injection strategy for partially premixed compression ignition combustion**. SAE Paper 2009-01-1527, 2009.

OKUDE, K.; MORI, K.; SHIROH, S.; MORIYA, T. **Premixed Compression Ignition (PCI) Combustion for Simultaneous Reduction of NOx and Soot in Diesel Engine**. *SAE International, SAE Paper 2004-01-1907*, 2004.

OMETTO, R. A. **Avaliação do Ciclo de Vida do álcool Etílico hidratado combustível pelos métodos EDIP, Exergia e Emergia.** Tese de Doutorado, Escola de Engenharia de São Carlos da Universidade de São Paulo, 2005.

PETERSON, C. L.; KORUS, R. A.; MORA, P. G.; MADSEN, J. P. **Fumigation with propane and transesterification effects on injector coking with vegetable oil fuels**. Transactions of the ASAE, American Society of Agricultural Engineers 30(1): 28-35. 1987.

PICKETT, L. M.; IDICHERIA, C. A. **Effects of Ambient Temperature and Density on Soot Formation under High-EGR Conditions.** *THIESEL 2006: Conference on Thermo- and Fluid Dynamic Processes in Diesel Engines.* Valencia: Editorial de la UPV, pag. 353-366. 2006.

PISCHINGER, F.; HAVENITH, C. **A New Way od Direct Injection of Methanol in a Diesel Engine.** Alcohol Fuels Technology Third International Symposium, Vol II, may 28-31-1979.

REITZ, R. D.; KOKJOHN, S. L.; HANSON, R. M.; SPLITTER, D. A. **Fuel reactivity controlled compression ignition (RCCI): a pathway to controlled high-efficiency clean combustion.** ‖ International Journal of Engine Research, **12**(3), pp. 209–226, 2011.

RICAUD, J.; LAVOISIER, F. **Optimizing the multiple injection settings on an HSDI diesel engine**. *Proceedings of the 3rd IMechE Automobile Division Southern Centre Conference on Total Vehicle Technology: finding the radical, implementing the practical* , pp.123-153. 2004.

RIESCO, J.; GALLEGOS, A.; MONTEFOR, J.; MARTINEZ, S. **Procesos Alternativos de Combustion en Motores de Combustión Interna.** Acta Universitaria, Universidad de Guanajuato, pp 36-54, 2005.

ROSILLO-CALLE, F.; HEAFORD, J.; **Alternative Developments in Brazil.** The Green Revolution Revisited (ed by B. Glaeser) Allen And Unwin, London, pp, 79-110, 1987.

RYAN, T.; ATHEAUS, A. **Fuel Requirements for HCCI Engine Operation**. SAE Technical Paper 2003-01-1813, doi: 10.4271/2003-01-1813. 2003.

SHIBATA, G.; OYAMA, K.; URUSHIHARA, T.; NAKANO, T. **Correlation of Low Temperature Heat Release with Fuel Composition and HCCI Engine Combustion.** SAE 2005-01-0138, 2005.

SHIBATA, G.; URUSHIHARA, T. **Realization of Dual Phase High Temperature Heat Release Combustion of Base Gasoline Blends**

from Oil Refineries and a Study of HCCI Combustion Processes. SAE International Journal of Engines October 2009 vol. 2 no. 1 145-163, 2009.

SIMESCU, S.; RYAN, T. W.; NEELY, G. D.; MATHEAUS, A. C.; SURAMPUDI, B**. Partial Pre-Mixed Combustion with Cooled and Uncooled EGR in a Heavy-Duty Diesel Engine.** *SAE International, SAE Paper 2002-01-0963*, 2002.

SINOR, J.; BAILEY, B. **Current and Potential Future Performance of Ethanol Fuels**. SAE Technical Paper 930376, doi:10.4271/930376. 1993.

SPLITTER, D.; REITZ, R.; HANSON, R. **High efficiency, low emissions RCCI combustion by use of a fuel additive.** SAE International Journal of Fuels and Lubricants, 3(2), pp. 742–756. 2010.

SUH, H. K. **Investigations of multiple injection strategies for the improvement of combustion and exhaust emissions characteristics in a low compression ratio (CR) engine**. Applied Energy, Vol. 88 no 12, pp. 8865-8870, 2011.

SUN, Y.; REITZ, R. D. **Modeling diesel engine NOx and soot reduction with optimized two-stage combustion"** SAE Technical Paper 2006-01-0027, 2006, doi:10.4271/2006-01-0027.

SUYIN, G.; HOON, K. N.; KAR, M. P. **Homogeneous charge compression ignition (HCCI) combustion: implementation and e_ects on pollutants in direct injection diesel engines**. Applied Energy, Vol. 88 no 3, pp. 559-567, 2011.

TAKEDA, Y.; KEIICHI, N.; KEICHI, N. **Emission Characteristics of Premixed Lean Diesel Combustion with Extremely Early Staged Fuel Injection.** SAE Technical Paper 961163, doi:10.4271/961163. 1996.

TAYLOR, C. **The Internal Combustion Engine in Theory and Practice**. The M.I.T. Press. 1994.

UMICORE. Umicore Automotive Catalyst – Global Emission Regulation. Disponível em: http://www.automotivecatalysts.umicore.com. Acesso em 28 nov. 2008.

VAGLIECO, B. **Multiple Injection Diesel Combustion Process in the High-Speed Direct Injection Diesel Engine.** Instituto Motori-CNR, Italy, 2010.

VAN GERPEN, J. H.; VAN METER, D. B. **Emission control in Diesel Engines by Alcohol Fumigation**. Department of Mechanical Engineering Iowa State University, 1990.

VOLPATO, O.; PIMENTA, V. **Diesel-Etanol Technology.** Delphi-Powertrain-Brazil, 1995.

WEAVER, C. S.; TURNER, S. H. **Dual Fuel Natural Gas/Diesel Engines: Technology, Performance, and Emissions.** Report to the Gas Research Institute, Engine, Fuel, and Emissions Engineering, Inc., Sacramento, California. 1994.

WELL-TO-WHEELS. **Analysis of Future Automotive Fuels and Powertrains in the European Context**, Version 2c, March 2007.

WISSINK, M. L.; LIM, J. H.; SPLITTER, D. A.; HANSON, R. M.; REITZ, R. D. **Investigation of injection strategies to improve high efficiency RCCI combustion with diesel and gasoline direct injection**. Paper ICEF2012-92107, Proceedings of ASME Internal Combustion Engine Division Fall Technical Conference, Vancouver, BC, Canada, September 23, 2012 - September 26, 2012.

YING, W.; WEI, L.; LONGBAO, Z. **Advanced combustion operation in a single cylinder engine.** International Journal of Thermal Sciences, Vol. 49, pp. 1303 - 1308, 2010.

ZHANG, H. **Experimental Investigation of Gasoline-DI-Methyl Ether Dual Fuel CAI Combustion with Internal EGR.** Thesis submitted for the degree of Doctor of Philosophy, School of Engineering and Desing, Brunel University, United Kingdom, December 2011.

ZOU, H.; WANG, L.; LIU, S.; LI, Y. **Ignition Delay of Dual Fuel Engine Operating With Methanol Ignited by Pilot Diesel.** Energy Power Eng, China, 2(3): 285-290. 2008.

Anexo I: Dados Técnicos do Sensor de Pressão Kistler tipo 2852A

SCP Slim for Engine Indication, Signal Conditioning Platform with optional PiezoSmart®
Types 2852A..., 4665Y51, 5064A...Y51, 5269Y51

KISTLER
measure. analyze. innovate.

Technical Data SCP Slim Type 2852A...

Chassis		
Module cards	max.	2
Channels per rack		4
with rack combination	max.	16
Power supply		
Standard (single module)	VDC	10 ... 36
Standard (cascading up to 4 modules)		11 ... 36
With external power supply	VAC	100 ... 240, ±10 %
Power consumption max.	W	20
Inrush current (Main und 3 Extension)	A	≈13
Degree of protection	IP	40
Fuse		8A slow-blow (SPT)
Operating temperature range[1]	°C	0 ... 50
Min. / max. temperature range[1]	°C	–40/50
Dimensions Type 2852A...		
Hight	HE (mm)	1 (41)
Width	mm	220
Depth	mm	230
Weight	kg	≈1,6
Software		Graphical User Interface (GUI) COM components for Microsoft Windows, 2000, XP

[1] non condensing

Digital I/0		
Digital I/0 Trigger/ Operate		
Input Optokoppler	–	Trigger via Optokoppler on analog output
High	V	3 ... 30
Low	V	<2
Current input High	mA	2 ... 29
Pull-up on +24 V (connectable)	kΩ	10
Pull-down on DGND (connectable)	kΩ	1
Connection	Typ	D-Sub 9 pin neg.
Digital output DOUTA1 ... B4	–	isolated solid with Foto/Mos Relais
Current load (continuous)	mA	<100
Voltage (continuous)	V	<±42
Voltage for external devices	V	24
Current draw max.	mA	50
Connection	Type	D-Sub 15 pin neg.

Connections

Analog-Output/Interface (integrated)		
Analog outputs		4
Voltage	V	0 ... ±10
Current (per channel)	mA	0 ... ±2
Error	%	<±0,1
Trigger output (optocouplers)		
High	V	>2,4
Low	V	<0,8
Pull-up on +5 V RS	kΩ	10
Connection	Type	D-Sub 37 pin neg.

Interface		
Interface	Type	RS-232C
Connetion	Type	D-Sub 9 pin neg.

Anexo II: iPOD 8427

Controlador desenhado para todos os tipos de injetores de bobina (solenóide) este equipamento oferece diferentes modos de controle de cada corrente, tensão ou tempo utilizado no modo de comando dentre suas principais características:

- IPOD 8427 apresenta seis configurações de condução adaptados para seu uso com diferentes injetores comerciais;
- Cada IPOD 8427 só pode ter controle sobre um injetor (conexão X6 EV);
- O IPOD 8427 é utilizado através do software XIPOD;

Para poder utilizar mais de um IPOD a comunicação deve ser feita através de uma ligação do RS485 ou de um conversor do tipo RS232/RS485 em este caso a comunicação com múltiplos IPODs é possível.

O software XIPOD pode controlar múltiplos IPOD's iguais (só injetores de bobina).

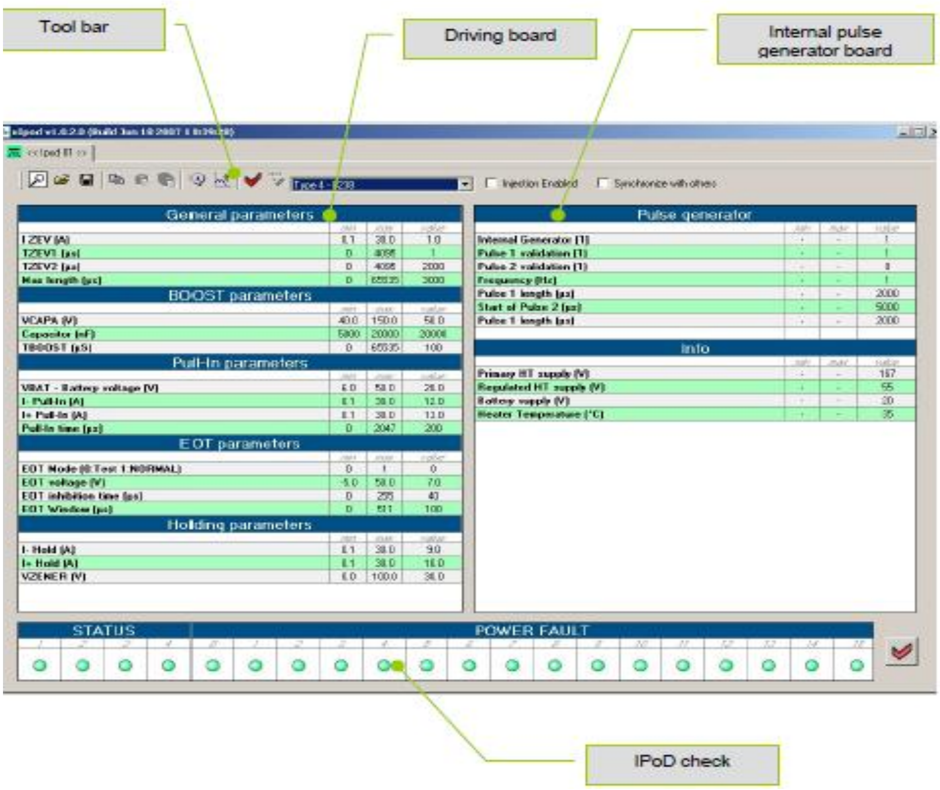

Figura A1 - Tela do software XIPOD.

Anexo III: High Pressure Regulator (HPR) 8244

O sistema HPR permite a regulação de alta pressão dentro dos sistemas de injeção diesel (common rail). Em função da alta pressão do sistema, um ou dois aturadores podem ser utilizados para regular a alta pressão, O comando é adaptado a cada tipo de sistema em função de:

- Número e do modo de funcionamento dos atuadores.
- Sinais provenientes da bomba.

O HPR instalado no LEV possui a seguinte configuração:

- Quadro de alimentação EFS 1712.
- Quadro de controle dos atuadores EFS 1522 (dois).
- Quadro do CPU. Unidade Central do regulador de alta pressão EFS 1521.
- Quadro de isolamento e adaptação dos sinais logicas de entrada e saída EFS 1526.
- Quadro de alimentação do captador de pressão EFS 1520.
- O HPR instalado no LEV possui dois quadros do tipo EFS1522 cada um deles configurado para o controle de atuadores para Diesel (X4) ou Gasolina (X5).

O software que é utilizado para configurar o HPR é o WINHPR com ele podem ser selecionados os parâmetros do atuador desejado (entre os quatro configurações para cada sistema). O software detecta automaticamente os portos de comunicação presentes e não utilizados.

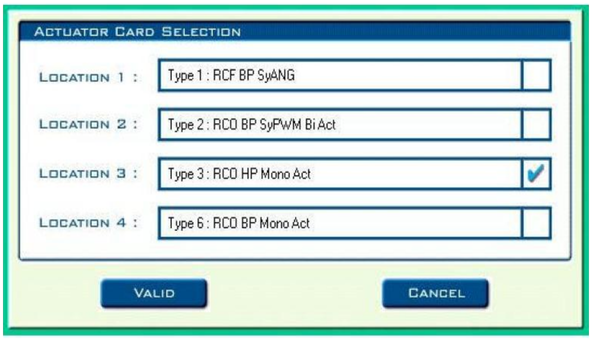

Figura A2 - Tela do software WINHPR

Anexo IV: Propriedades Termofísicas

Tabela IV – Propiedades termofisicas do ar, diesel e etanol (20°C e 1atm)

Propriedades	Unidades	Ar	Diesel	Etanol
Massa Molar	kg/kmol	28,97	170	46,07
Massa Especifica a 20°C	kg/m^3	1,2	820-850	789
Calor especifico a Volume cte, cp	kJ/kg.K	1	2,688	2,39
Calor especifico a Pressão cte, cp	kJ/kg.K	0,718	2,737	-
Relação de calores específicos	-	1,4	1,018	26,7
Condutividade Térmica	W/m.K	26,24	0,03134	-
Calor latente de vaporização	kJ/kg	-	-	903
Constante de gás ou vapor ideal	kJ/kg.K	0,287	-	-
Viscosidade absoluta	Cst	$0,01846x10^{-3}$	3,71	1,78
Relação ideal ar-combustível	kg/kg	-	15,14/1	9,07
Limites flamabilidade vol.	%	-	0,5-0,7	4,3-19
Poder Calorifico inferior	kJ/kg	-	42,45	26,75

Anexo V: Análise de incertezas experimentais

Nos resultados finais de trabalhos experimentais, existem erros provenientes de fatores que influenciam na precisão de medição, tais como: incerteza do instrumento de medição, metodologia empregada e erros aleatórios. Para atenuar os efeitos desses erros, costuma-se repetir a medida várias vezes e efetuar um tratamento estatístico. O emprego de um método estatístico em um estudo científico aplica-se quando a variabilidade, complexidade ou parcial desconhecimento das origens do fenômeno comprometem a confiabilidade dos resultados. O resultado obtido pelas técnicas estatísticas permite alcançar uma série de comportamentos gerais frente a casos acidentais ou isolados, com os quais se fabrica um modelo. No Brasil, o INMETRO (Instituto Nacional de Metrologia, Normalização e Qualidade Industrial) publicou o "Vocabulário Internacional de Termos Fundamentais e Gerais de Metrologia" (1995) que está em consonância com o ISSO 4006 "The International Standardisation Organization" e define o termo Incerteza como "Parâmetro, associado ao resultado de uma medição. Que caracteriza a dispersão dos valores que poderiam ser razoavelmente atribuídos ao mensurado". Em outras palavras, Incerteza de Medição (Uncertainty of Measurement) é a metade da faixa dentro do qual o valor verdadeiro (ou convencional) é esperado acontecer com uma determinada probabilidade.

Taylor r Kuyatt (1993) descrevem que a propagação das incertezas experimentais da medida de variáveis independentes (x_1, x_2....x_3), pode ser estimada da seguinte média pitagórica

$$I_Y = \frac{\delta I_Y}{I_Y} = \pm\left\{\left(\frac{X_1}{Y}\frac{\partial}{\partial X_1}\right)^2 + \left(\frac{X_2}{Y}\frac{\partial}{\partial X_2}\right)^2 + \cdots + \left(\frac{X_n}{Y}\frac{\partial}{\partial X_n}\right)^2\right\}^{\frac{1}{2}} \qquad \text{(A -1)}$$

Como neste trabalho foram obtidos resultados dependentes de medições individuais, decidiu-se explicitar a propagação das incertezas de medição, ou seja, a incerteza do resultado consiste no conjunto de incertezas de outras variáveis independentes relacionadas com o resultado final.

A tabela A-1 apresenta a incerteza padronizada dos principais medidores utilizados na experiência:

Parâmetros Avaliados	Unidade	Incerteza
Massa de óleo diesel	g	0,1 g
Massa de etanol hidratado	g	0,1 g
Pressão*	Bar	±0,1%
Resolução da MCR	mm	0,05 mm

*A classe de precisão de um sensor KISTLER é determinada pelo valor máximo de grandezas de influência especificados (em percentagem), no entanto, a precisão não corresponde ao esquema de classificação de acordo com as diretrizes EN ISO 376 ou DIN 51309.