The Elsbett gas-exchange-system Potential for efficiency improvement of combustion engines by the ELSBETT load changing system Better gas exchange Lower heat losses Two- and Four-Stroke OPE Better gas exchange Two- and Four-Stroke MaxE-Line Engine efficiency Better gas exchange + VCR η_e ♦ η_e=56% η_e=55% n_e=48% More often n_e=54% n_e=53% operated away Large Diesel Large Diesel from best n_e=45% Only engines engines n_=45% Diesel point **Heavy Duty** Two-Stroke Four-Stroke occasionally n_e=41% Petrol (Vessel, Power (Vessel, Power Vehicles operated in n_e=35-38% In best point Station) Station) best point η_e=42% Diesel Diesel Fuel Crude Oil Crude Oil η_e=37% Petrol CNG Diesel Oil Diesel Oil η_e=30-35% Diesel Passenger car CNG CNG n_e=25-28% n.=20-25% Petrol In best point HDV Diesel Fuel Average η_e=20-25% Diesel Gasoline driving cycle η_e=10-15% Petrol CNG Passenger car LPG City cycle a) Installation space and weight Limited design Strong weight and nearly no limitation flexibility space limitation Design and layout also Design and layout for wide b) Stationary operation mainly in best point; means: mechanical and for different operationrange of speed and load thermodynamic optimization of engine conditions operation conditions

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