Model of electrical-generator set (EGS)

- the diesel engine (DE),
- the permanent magnet synchronous gene
- the power converter (PC)
- Two control units (RS-1 and RS-2). The

variables:
ω :angular speed of the diesel engine
TL: generator loads
ωp:required angular speed
PL : power load,

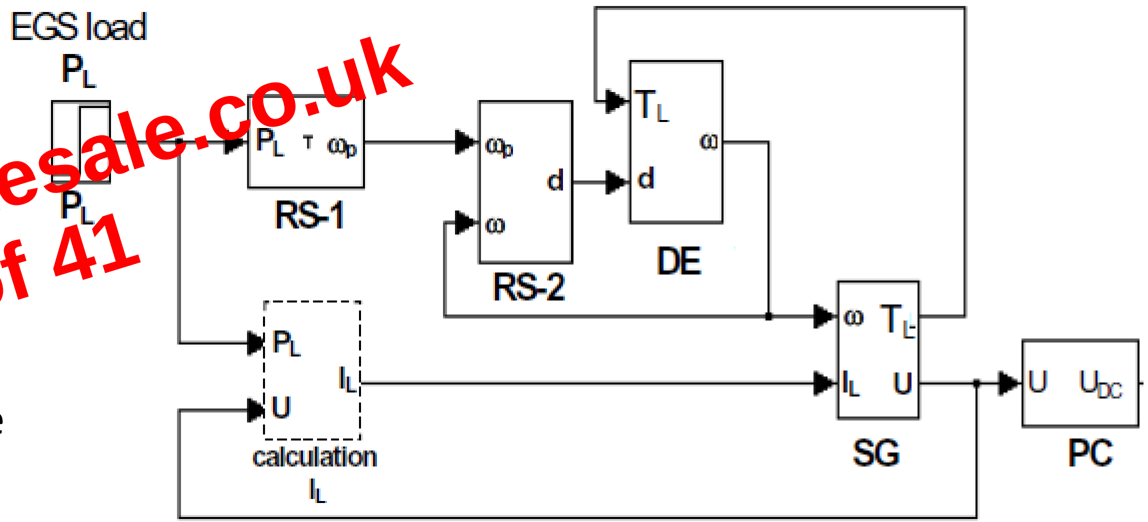


Figure 10. The mathematical model of the EGS in Matlab-Simulink graphics

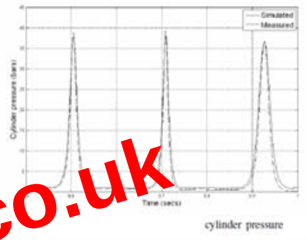
steady-state error

$$e_S = e_S(\omega_P, T_L) = \frac{\omega_P}{1+K_M K_R} + \frac{K_L(T_S+T_L)}{1+K_M K_R} =$$

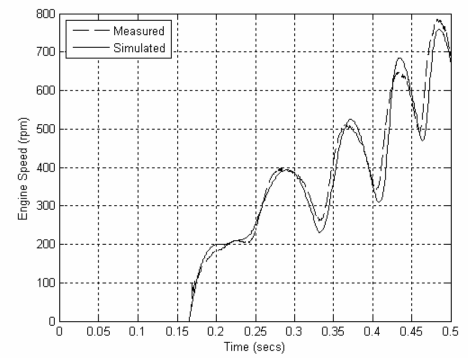
$$= \frac{\omega_P + K_L(T_S+T_L)}{1+K_M K_R} = \frac{r_1\,\omega_P + (T_S+T_L)}{r_1 + m_1 K_R}$$

Dynamic Behavior of Mobile Generator Set with Variable Speed and Diesel Engine 2007

Physical Model for Diesel Engine



cylinder pressure



igure 12 Comparison of measured and simulated speed

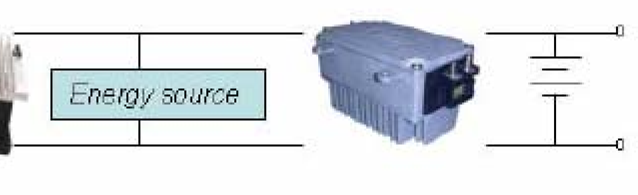
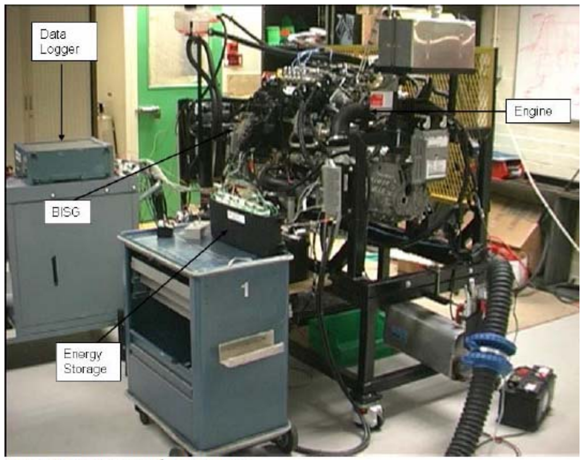


Figure 1 Schematic of electric system with energy storage



igure 8 Engine cranking test rig

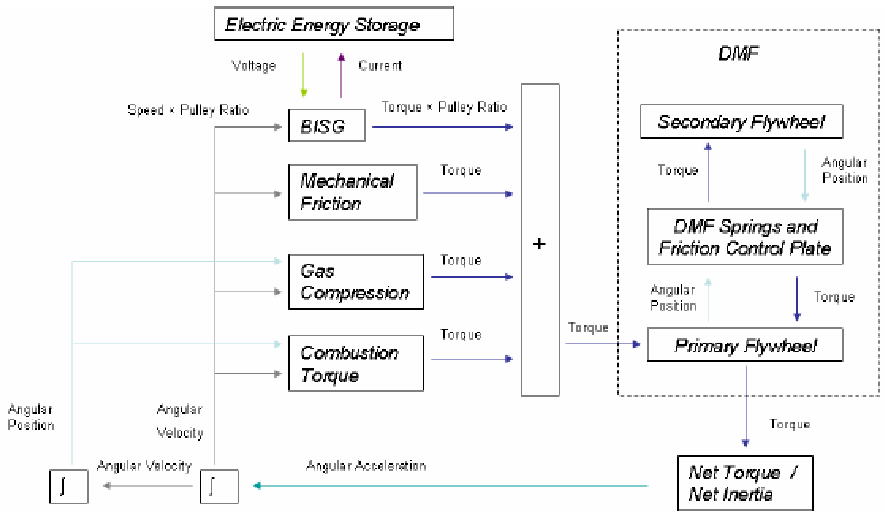
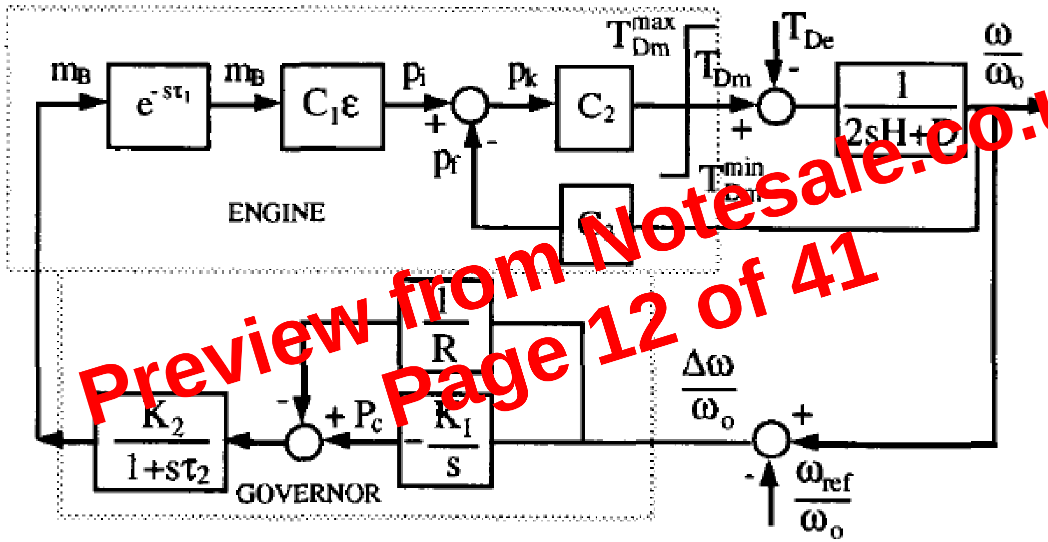


Figure 3 Scheme of model calculation

0C Physical Model for Investigation of Diesel Engine Cranking by Belt-driven Integrated Starter Generator 2007

diesel-wind turbines



Diesel engine - Governor model.

crankshaft to the heat consumed

$$\varepsilon = \frac{z\, W_i \nu}{\dot{m}'_B H_u}$$

effective pressure p_i of the engine is

$$p_i = \frac{W_i}{V_h}$$

$$p_i = \frac{H_u}{z V_h \nu}\, \dot{m}'_B \varepsilon = C_1 \dot{m}'_B \varepsilon$$

$$p_f = C_3 \omega \quad (\omega = \pi P f_m)$$

The real mean effective pressure p_k of the engine

$$p_k = p_i - p_f$$

The real mechanical power P_{D_m} of the Diesel engine is given by the equation :

$$P_{Dm} = z V_h \nu p_k = V_H \nu p_k = V_H \frac{\omega_m}{\pi K} p_k \tag{14}$$

The mechanical torque T_{D_m} of the engine is then given by the following relation in the p.u. system :

$$T_{Dm} = \frac{P_{Dm}}{\omega_m T_b} = \frac{V_H}{\pi K T_b} p_k = C_2 p_k \tag{15}$$

1A A general simulation algorithm for the accurate assessment of isolated diesel-wind turbines systems interaction. I. A general multimachine power system model 1995

2.6 Synchronous generator

The equations of synchronous generator are obtained from Park equations after some simplifications [4, 17]. The most important is that stator transients are neglected as much faster compared to the rotor ones.

subtransient and transient phenomena can be examined [17, 25].

The algebraic stator equations are in p.u. :

$$V_d = E_d'' - r_s I_d + X_q'' I_q\,, \qquad V_q = E_q'' - r_s I_q - X_d'' I_d \tag{22}$$

The differential equations corresponding to the rotor winding dynamics are in p.u. :

$$\frac{dE_d''}{dt} = -\frac{1}{T_{qo}''}\left[E_d'' - (X_q - X_q'')I_q\right] \tag{23}$$

$$\frac{dE_q'}{dt} = -\frac{1}{T_{do}'}\left[E_{fd} - \frac{X_d - X_d''}{X_d' - X_d''}E_q' + \frac{X_d - X_d'}{X_d' - X_d''}E_q''\right] \tag{24}$$

$$\frac{dE_q''}{dt} = -\frac{1}{T_{do}''}\left[E_q'' - E_q' + (X_d' - X_d'')I_d\right] \tag{25}$$

The electromagnetic torque equation is in p.u. :

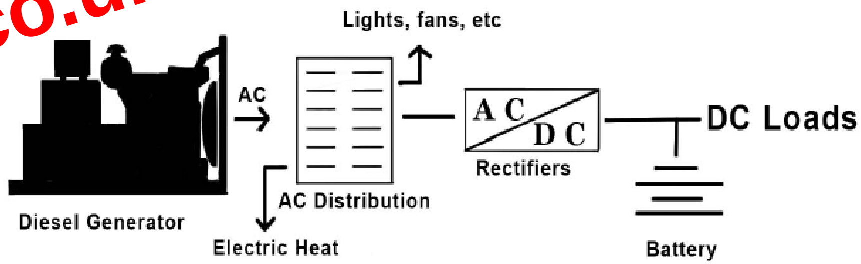
$$T_{De} = E_d'' I_d + E_q'' I_q - (X_d'' - X_q'')I_d I_q \tag{26}$$

The machine current, output voltage and power given by (8) for the asynchronous generator are also valid here.

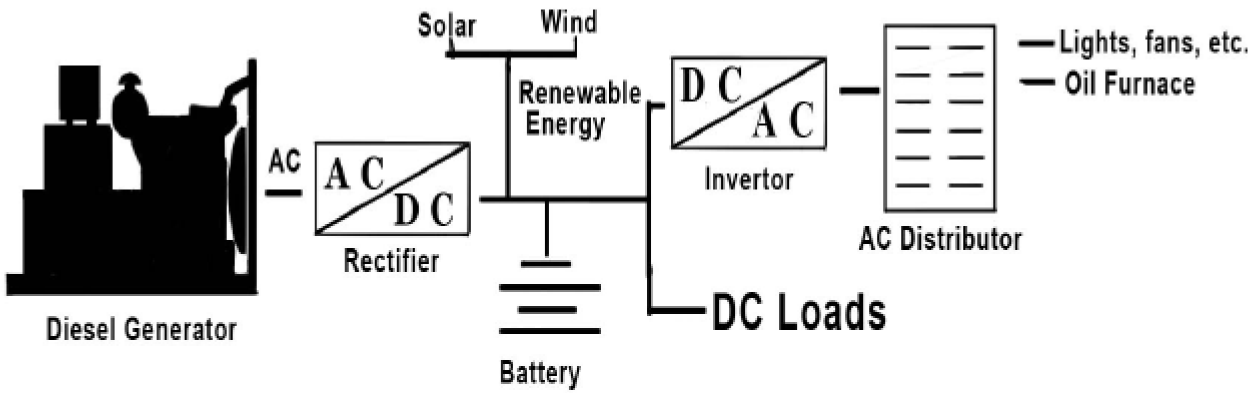
1A A general simulation algorithm for the accurate assessment of isolated diesel-wind turbines systems interaction. I. A general multimachine power system model 1995

Investigation into the Viability of Replacing Internal Combustion Diesel Generators with Diesel Fired Stirling Engine Generators for Remote Microwave Radio Telecommunication Applications

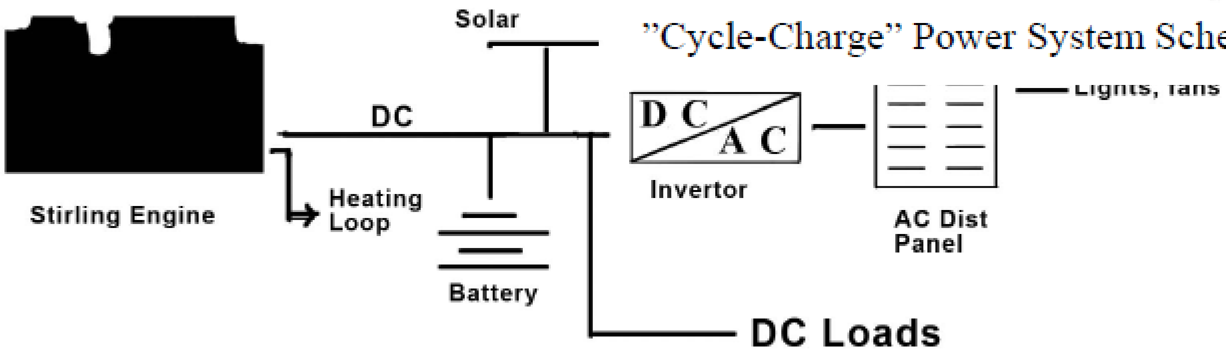
PV/Diesel Hybrid site operated in Cycle-Charge mode



"Prime" Power System Schematic



"Cycle-Charge" Power System Schematic



The active

and reactive power on the dq axis is indicated by

$$\begin{cases} p_{dq} = \mathbf{v_c} \cdot \mathbf{i} = v_{cd} i_d + v_{cq} i_q \\ q_{dq} = \mathbf{v_c} \times \mathbf{i} = v_{cd} i_q - v_{cq} i_d \end{cases}$$

$$\begin{cases} p_{dq} = v_{cq} i_q \\ q_{dq} = -v_{cq} i_d \end{cases}$$

power $P_{\gamma\delta}$ on the $\gamma\delta$ axis is obtained by

$$p_{\gamma\delta} = \mathbf{e} \cdot \mathbf{i_g} = v_{cq} \cos\phi \cdot \frac{i_q}{\cos\phi} = p_{dq}$$

$$i_q^* = \frac{p_{dq}^*}{v_{cq}}$$

$$i_d^* = -\frac{X_L i_q^{*2} v_{cq}}{e_\delta^2}$$

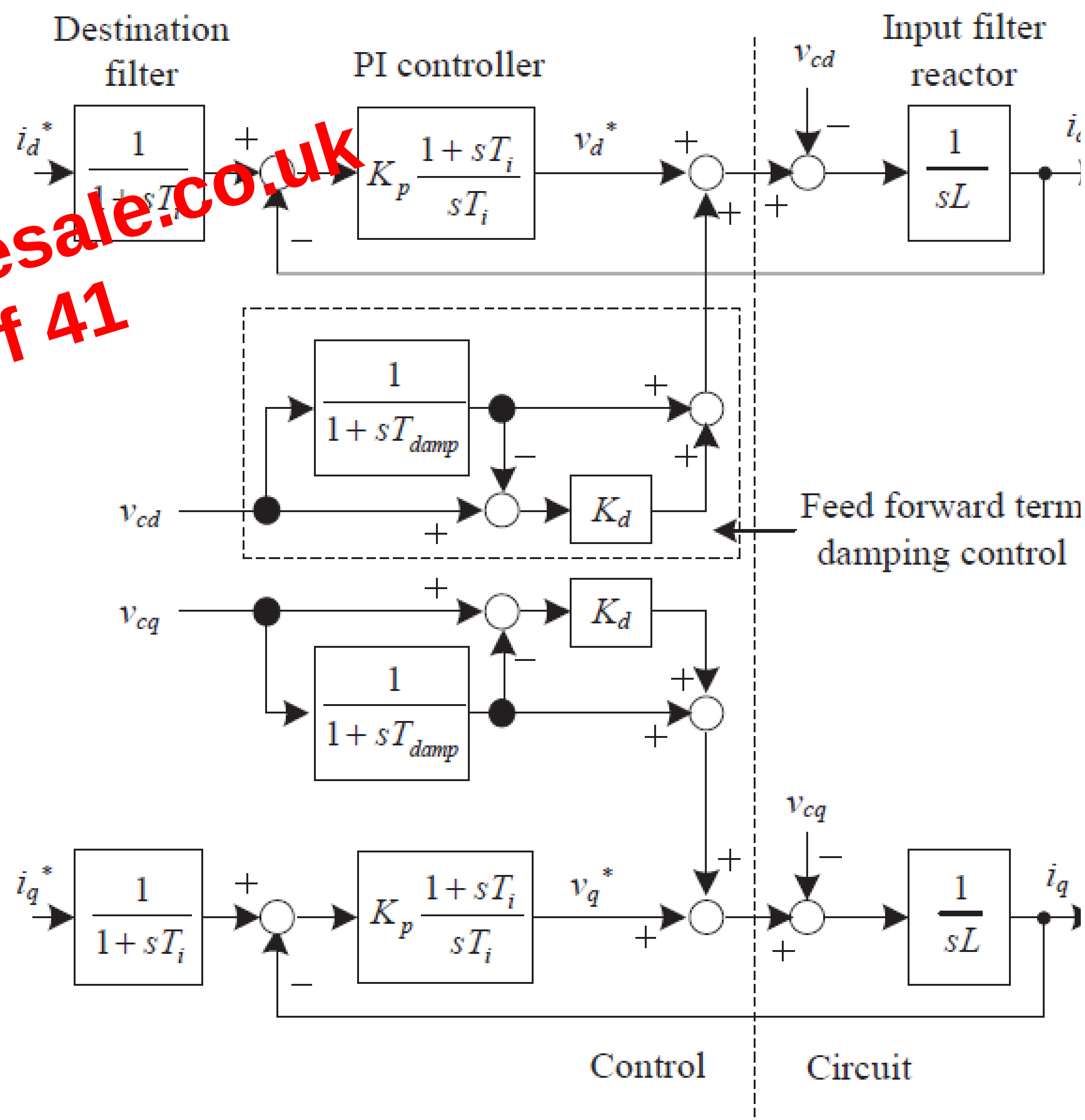


Fig. 7. Transfer function block diagram in ACR to control the input cur
of the matrix converter.