Bare Demo of IEEEtran.cls for IEEE Conferences

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***Abstract*—The abstract goes here.**

I. Introduction

The increase of the aircraft operational costs associated with the fuel consumption makes this subject one of the main concern in the development of the new aircraft projects. In this scenario, the aviation market has been changed the design perception with respect of use of the electrical system. The electrical system dependency to power an increasing number of embedded systems and, in some cases, replacing the power source where it used to be powered by hydraulic and pneumatic system has increased in the past few years, creating the concept of the More Electrical Aircraft (MEA).

This context raised the relevance of the electrical system in the hole of aircraft operational safety. In this way, the electrical system needs to have a greater reliability and to operate in a way to avoid failures of the equipment connected to it. However, the rise of electrical equipment connected in the electrical system, specially the non-linear loads, has increased the harmonic distortion content being introduced in the electrical grid, diminishing the power quality and becoming a subject of study in aircraft operational safety. To allow the systems equipment and electrical systems proper integration, some documents were released to standardize the electrical parameters, such as the DO-160 and the MIL-STD 704. These documents bring the electrical parameter acceptance, and one of these constraints are regarding of the power quality and Total Harmonic Distortion (THD).

talvez seja retirado

To improve the power quality with the decreasing of the THD, some power conditioners are applied in the equipment power input and in the electrical power distribution systems, such as filters and high power factor converters. However, the implementation of these conditioners has a drawback, which is the increase of the weight, volume and complexity, whereas the reliability decreases.

colocar as devidas referłncias

terminar esse captulo de acordo com o contedo que ser apresentado no restante do artigo

A introduo deve conter trłs pontos importantes. Motivao do trabalho: interesse, aplicaes possveis e problema sendo resolvido. Realizaes anteriores: mencione artigos que descrevam trabalhos semelhantes (mesmo problema ou outras solues). No descreva com detalhes as realizaes anteriores, destaque pontos importantes que deixem claro a contribuio do seu trabalho. Contribuio do trabalho: qual a novidade que est sendo proposta (uma nova soluo, uma nova arquitetura, um desempenho melhor etc.).

II. Power Quality in Aircraft

falar das normas aeronuticas que estabelecem limites para o contedo harmnico na rede eltrica

colocar os principais mtodos de correo de fator de potłncia empregado e justificar o emprego do filtro ativo

Descrio com mais detalhes de realizaes anteriores. Necessrio pesquisar outras fontes e coloc-las no item Referłncias. Compare: resultados atingidos, limitaes, desempenho, pontos de destaque, problemas etc. Explique com as suas prprias palavras os trabalhos anteriores. NUNCA copie um texto integramente de um outro artigo.

A. Active Filters

The active filter operates creating waveforms to interact with the voltages and currents presented in the electrical grid to establish a power factor equal to one. This is accomplished by measuring the voltage waveforms from the power source and the current waveforms from the load, and then using these parameters on the instantaneous power theory to determine the current reference as an input to be set in a compensator. The compensator injects current waveforms in the circuit with symmetrical values of the components which degrades the power factor. The typical system compounded by a non-linear load with an active filter is presented in Figure 1 (**??**).

B. Instantaneous Power Theory

The instantaneous power theory was presented by Akagi [**?**], which proposed some new concepts for the instantaneous active and reactive power. This theory can be used in three phase, three or four wire system and in steady or transient state [**?**], [**?**]. In this theory, the manipulation of the active and reactive power calculations brings a tool to determine the currents that carry some content which degrade the power factor, such as harmonic distortion and phase shift. Considering a three-phase system, composed by the phases a, b and c, the instantaneous power theory is based in the coordinates transformation from the abc to $\alpha\beta0$. This is known as the Clarke Transformation and is shown in eq. (2) 1.

$$\begin{bmatrix} v_0 \\ v_\alpha \\ v_\beta \end{bmatrix} = \sqrt{\frac{2}{3}} \begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ 1 & -\frac{1}{2} & -\frac{1}{2} \\ 0 & \frac{\sqrt{3}}{2} & -\frac{\sqrt{3}}{2} \end{bmatrix} \begin{bmatrix} v_a \\ v_b \\ v_c \end{bmatrix}; \qquad \begin{bmatrix} i_0 \\ i_\alpha \\ i_\beta \end{bmatrix} = \sqrt{\frac{2}{3}} \begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ 1 & -\frac{1}{2} & -\frac{1}{2} \\ 0 & \frac{\sqrt{3}}{2} & -\frac{\sqrt{3}}{2} \end{bmatrix} \begin{bmatrix} i_a \\ i_b \\ i_c \end{bmatrix} \tag{1}$$

According to [**?**], the instantaneous power is defined as shown in eq (3) 2, where the p_0, p and q are the instantaneous zero-sequence power, the active instantaneous power and the reactive instantaneous power, respectively [**?**], [**?**].

$$\begin{bmatrix} p_0 \\ p \\ q \end{bmatrix} = \begin{bmatrix} v_0 & 0 & 0 \\ 0 & v_\alpha & v_\beta \\ 0 & v_\beta & -v_\alpha \end{bmatrix} \begin{bmatrix} i_0 i_\alpha \\ i_\beta \end{bmatrix} \tag{2}$$

Considering a system without zero-sequence voltage and/or current, such as the aircraft electrical system, the eq (3) can be simplified as the eq (4), where the instantaneous zero-sequence power is absent.

$$\begin{bmatrix} p \\ q \end{bmatrix} = \begin{bmatrix} v_\alpha & v_\beta \\ v_\beta & -v_\alpha \end{bmatrix} \begin{bmatrix} i_\alpha \\ i_\beta \end{bmatrix} \tag{3}$$

The reverse calculation, i.e., the determination of the currents i_α and i_β when the voltages v_{alpha} and v_β and the instantaneous power p and q are known is presented in eq. (5) 4.

$$\begin{bmatrix} i_\alpha \\ i_\beta \end{bmatrix} = \frac{1}{v_\alpha^2 + v_\beta^2} \begin{bmatrix} v_\alpha & v_\beta \\ v_\beta & -v_\alpha \end{bmatrix} \begin{bmatrix} p \\ q \end{bmatrix} \tag{4}$$

By definition, the active instantaneous power is composed by the energy that is swapped between two subsystems, whereas the reactive power is composed by the energy being swapped between the 3 phases of the system [**?**]. Furthermore, both p and q can be defined as a composition of an average ($\overline{p}$ and $\overline{q}$) and an oscillating ($\tilde{p}$ and $\tilde{q}$) values, as defined in eq. (6) 5.

$$\begin{aligned} p &= \overline{p} + \tilde{p} \\ q &= \overline{q} + \tilde{q} \end{aligned} \tag{5}$$

To create an active filter to coordinate a power factor equal to 1, the only permitted power flowing in the transmission lines is the average value of the instantaneous active power ($\overline{p}$). To ensure this condition, the filter must inject in the lines currents which contains the symmetrical values of the instantaneous reactive power (q) and the oscillating portion of the instantaneous active power ($\tilde{p}$) created by the non-linear load. By doing this, these powers are cancelled in the same way as the current harmonic content. Thereby, the selection of power to be compensate and processed by the filter must contains the values of the $-\tilde{p}$ and $-q$ only.

The filter full operation is defined by the instantaneous power p and q calculation, followed by the selection of the power to be compensated, i.e., $-\tilde{p}$ and $-q$. Afterwards, the currents i_α and i_β are calculated using the eq (5) 4 with the values $-\tilde{p}$ and $-q$, followed by the inverse Clarke transformation to acquire the current in abc coordinates to be applied as a reference in the compensator. The whole active filter reference definition is shown in Fig. (7) **??**.

C. Control Strategy

The active filter specified by the calculations procedure as defined in Fig (7) **??** presents very effective to set the current reference to be applied in the compensator to mitigate the electrical system harmonic content. However, this calculation is valid to produce sinusoidal waveforms only when the voltages measured and used in the filter input is pure sinusoidal. This happen due to the filter operates allowing only the mean value of the active instantaneous power flowing in the circuit. Therefore, the use of a non-sinusoidal voltage waveform in the input of the filter cause the filter to creates a non-sinusoidal current waveform to order to establish the power flow without q and $\tilde{p}$.

In aircraft electrical power system the voltage waveforms stated in the point of common connection (PCC) are presented as non-sinusoidal, but still limited by the aeronautical standards. As the voltages are measured at this point, the operation of the filter is not optimal for power quality purposes, and in some cases, might decrease the power quality and operates unstably depending the levels of harmonic distortion presented in the voltages waveforms.

According to cite Akagi2007, the p-q theory proves insufficient to satisfy the non-linear loads filtering in systems with previously distorted voltages waveforms and, at the same time, to satisfy the conditions of injecting a sinusoidal current and setting a flow of a constant flow active instantaneous power.

Colocar os mtodos de controle, focando no mtodo de controle de corrente senoidal

Falar do controle de tenso do capacitor (se couber, ou falar bem sucintamente)

Descrio da sua proposta com detalhes. Mtodo empregado para resoluo do problema (equacionamento, pseudo cdigo, diagrama de blocos etc.). Caso utilize componentes especficos na implementao (circuito integrado, sensor etc.), no exagere na descrio dos mesmos (fotos, dados tcnicos, especificao etc.). O leitor pode obter estes dados na referłncia que vocł indicou.

LATEX COMMANDS

(2)
(3)
(4)
(5)
(6)

III. Simulation of the Shunt Active Filter Operating with an Electrohidraulic Actuator

colocar o diagrama do Sistema completo que foi proposto

Falar bem sucintamente dos modelos empregados, falando do sistema de gerao, distribuio e EHA

colocar os resultados da simulao para o caso onde no h carga e para a mxima carga. Apenas curvas de forma de onda de tenso e corrente e espectro de frequłncia (se couber, tambm no perodo com pouca carga)

Testes / ensaios. Deixe claro como foram realizados os ensaios, tipo de montagem, identifique possveis problemas que interferiram nos resultados etc. Convena o leitor que vocł realizou os testes / ensaios incluindo figuras, grficos etc. Apresente os resultados e compare com trabalhos disponveis na literatura. Discuta pontos fortes e fracos (do seu trabalho e trabalhos anteriores). No exagere nos resultados positivos atingidos e no enfatize em demasia os pontos negativos de outros trabalhos (o revisor do seu artigo pode ser um dos autores dos trabalhos que vocł est comparando).

IV. Conclusions

sintetizar uma breve concluso derivada da dissertao

Com base em tudo que foi escrito, enfatize a sua contribuio sem exageros. Trabalhos futuros, deixe-os para um outro artigo. Concentre-se no que foi realizado.

Traduzir as Figuras

V. Introduction

This demo file is intended to serve as a "starter file" for IEEE conference papers produced under LaTeX using IEEEtran.cls version 1.8b and later. I wish you the best of success.

mds

August 26, 2015

A. *Subsection Heading Here*

Subsection text here.

1) Subsubsection Heading Here: Subsubsection text here.

VI. Conclusion

The conclusion goes here.

Acknowledgment

The authors would like to thank...

References

[1] H. Kopka and P. W. Daly, *A Guide to LaTeX*, 3rd ed. Harlow, England: Addison-Wesley, 1999.