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Parameters Setting of Power System Stabilizer PSS2A

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***Abstract*— PSS2A(B) is a kind of dual-input power system stabilizer which takes rotational speed deviation and electrical power deviation as its inputs. The shaft torsion signal introduced by the rotational speed deviation have an effect on the low frequency signal each other. The interactions affect the parameters setting of PSS 2A the PSS 2A is used to improve the damping of the power system oscillations and the general stability of the power generation including transmission system**

Keywords*— *power system stabilizer; RTF Analysis; Analysis of the influence of RTF; (key words)

I. INTRODUCTION

Nowadays, Integral-of-Accelerating Power Stabilizer is widely used in power system stable control. The typical PSS is IEEE standard PSS2A(B) model as shown in Fig. (1)

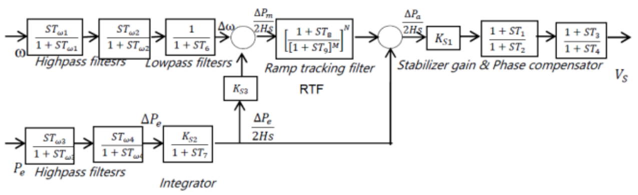

Fig.(1) power system stabilizer (PSS2A)

The input signals are the angular frequency of the rotor (ω) and the electrical power (Pe), the two wash-out filters ($TW1$, $TW2$) eliminate the steady state components of the inputs signals . ($T6$& $T7$) represented the input filters. Ks2 is used to adapt the scaling of the two inputs and should be equal to ($T7/2H$), where H is the inertia constant of the generator and turbine. The ramp tracking filter ($T8$, $T9$,M and N) is a low pass filter that eliminate any high frequency components. $KS1$ determine the gain of the stabilizer and the lead-lag stages with non-windup limiter ($T1$, $T2$, $T3$, $T4$) provide phase compensation

PSS2A takes the speed deviation signal and electrical power signal as the input signals, and sets up the RTF module to reduce or eliminate the impact of the rotor torsional vibration filter when the speed signal is inputted [5]

II. IMPACT ANALYSIS OF RTF

By phase compensation, PSS provides positive damping for the system in low frequency band and the sub-synchronous frequency band, and the phase frequency characteristic reflects the effectiveness of damping[2].

By analyzing the phase frequency characteristics of PSS, the influence of RTF on sub-synchronous signal and low-frequency signal and the interaction between sub-synchronous signal and low-frequency signal are available.[5]

At turbine load ramps the normal oscillations of the Pe-signal are still transferred by the PSS, so that the damping function of the PSS remains still active. The "Ramp Track"-filter(RTF)must be adjusted in such a way, that the shaft torsional oscillations are removed, but resulting signal changes at fast turbine load ramps are transferred. [3]

The indices M and N allow a “ramp tracking” or simpler filter(RTF) characteristic to be represented. To model all existing field uses of the ramp-tracking filter, the indices M and N should allow integers up to 5 and 4, respectively. Typical values of M = 5, N = 1 or M = 2, N = 4 are in use by several utilities. [4]

III. ANALYSIS OF THE INFLUENCE OF RTF

Speed deviation signal as its input, it will bring the issues about noise and shaft torsion vibration.

The main role of RTF is to filter out the torsional vibration signal form the speed deviation signal,

and the frequency of torsional vibration signal is located in the sub-synchronous frequency band Based on the data obtained in the calculation example of this paper following figures are analysis and explanation. RTF will have a certain impact on the PSS as shown in Fig. 2

A. Analysis of the influence of RTF with different prameter

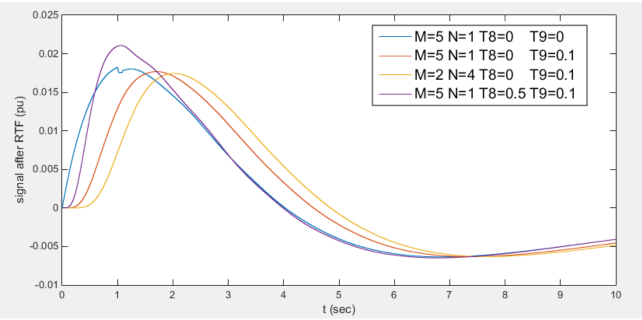

Fig.(2) signal after RTF with different parameter

Analysis of the Influence of RTF we make the parameter as follows:- the value $TW1$, $TW2$, $TW3$, $TW4$& $TW7$is (2) and the value of $TW6$ is (0.01) and the value of $KS2$ is (1) and the value of $KS3$ is (0.133) and make three phase fault in the network for 0.08 seconds and only change the parameter for RTF ($T8$, $T9$,M and N)

It can be seen from the figure (2) the signal after RTF it is different between the values that Influence of RTF torsional vibration signal form the speed deviation signal This indicates the effectiveness of RTF in responding to malfunctions in network failures

B. Analysis of the influence of RTF with different faults

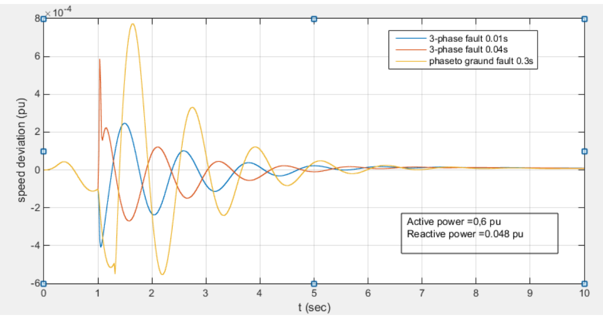

Fig.(3)speed deviation at different faults

It can be seen from the figure (3) the speed deviation at different three phase fault in the network as follows:- three phase fault for 0.01 s , three phase fault for 0.04 s and phase to ground fault for 0.3 s

Since the deviation in speed is different, we observe the effect of RTF in responding to various network failures Where we observe the response from the RTF to the oscillation signal resulting from the malfunction As shown in Figure(4)

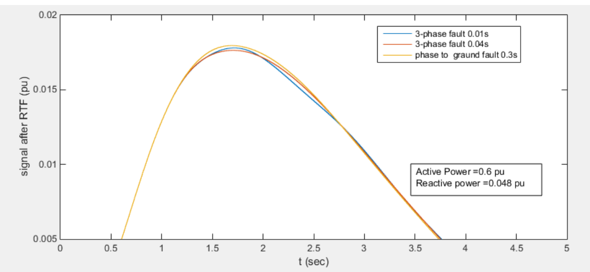

Fig.(4) signal after RTF at different faults

It can be seen from the figure (4) the signal after RTF at different faults with RTF parameter ($T8$=0 , $T9$=0.1 ,M=5 and N=1) Where we observe the effect of RTF in damping the oscillation resulting from the failure

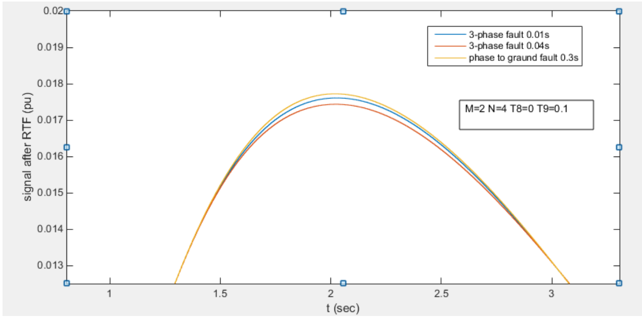

Fig.(5) signal after RTF at different faults and different parameter

In Fig. 5 the same malfunction was applied but the parameter were changed RTF parameter ($T8$=0 , $T9$=0.1 ,M=2 and N=4) Where we observe the effect of RTF in damping the oscillation resulting from the failure

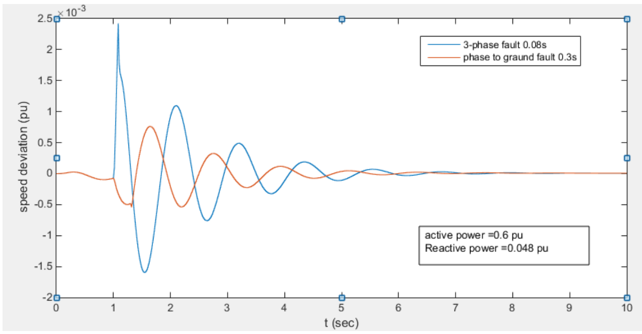

Fig.(6)speed deviation at different faults

It can be seen from the figure (6) the speed deviation at different three phase fault in the network as follows:- three phase fault for 0.08 s and phase to ground fault for 0.3 s

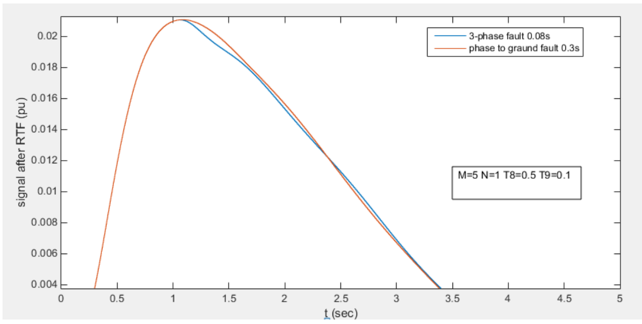

Fig.(7) signal after RTF at different faults and different parameter

It can be seen from the figure (7) the signal after RTF at different faults with RTF parameter ($T8$=0 , $T9$=0.1 ,M=5 and N=1) Where we observe the effect of RTF in damping the oscillation resulting from the failure

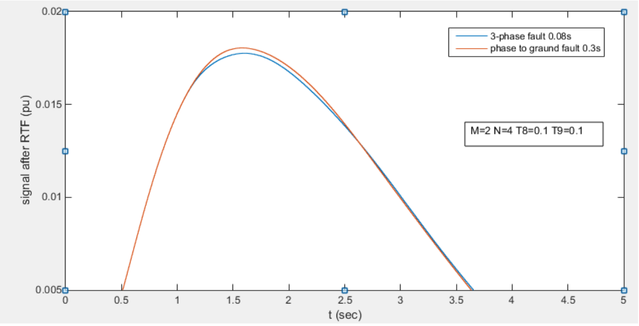

Fig.(8) signal after RTF at different faults and different parameter

In Fig. 8 the same malfunction was applied but the parameter were changed

RTF parameter (*T*8=0 , *T*9=0.1 ,M=2 and N=4) Where we observe the effect of RTF in damping the oscillation resulting from the failure

The frequency value when a malfunction occurs is between 0.125 HZ to -0.12 HZ in three phase fault for 0.08 s and 0.05 HZ to -0.04 HZ in phase to ground fault for 0.3 s

Refer to Figure 4 and 5, we notice the effect of RTF on large and small faults, especially when the parameters (*T*8=0 *T*9=0.1 ,M=2 and N=4)

In Fig. 7 and 8, we also notice the effect of RTF on large faults resulting in frequency and power fluctuations, especially when parameters (*T*8=0 , *T*9=0.1 ,M=2 and N=4)

To be an effect of RTF is most effective, especially when compared to PSS output results

IV. CONCLUSIONS

The dual-input power system stabilizer of PSS2A is more and more widely applied with its own characteristics and advantages. This paper analyzes the effect of RTF in damping the oscillation resulting from the failure We noted that most companies do not use parameters (*T*8=0 , *T*9=0.1 ,M=2 and N=4) although it is more effective, especially in large and medium faults as shown in the results of the test PSS2A

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