

Potential induced degradation (PID) tests for commercially available PV modules

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INTRODUCTION

As it causes large output power decrease in short term, potential induced degradation (PID) inflicts large loss on users [1]. Some methods to reproduce PID phenomena were reported [2,3]. We applied two PID test methods, that is, so-called chamber method [2] and water film method [3], to various PV modules made by domestic and overseas PV module makers, purchased from markets.

EXPERIMENTS AND METHODS

In the chamber method, PID tests were conducted with 15 PV module types (Table 1, type A to O), the number of sample N=2, respectively, under the condition described in the IEC 62804 draft (November, 2012), that is, 60 °C, 85%RH, 96 h.

In the water film method, the test procedure is as follows: PV module was installed horizontally so that its front side faces upward in the air-conditioned room kept at 25 °C. Front surface was covered with water film, then it was covered with plastic film to prevent water evaporation. Wiring for applying voltage is the same way described in the IEC 62804 draft. Test duration is 7 days. In this method, 6 PV module types (Table 1, type A,B,C,E,F,G) were tested with the number of sample N=3, respectively.

RESULTS

Figure 1 shows the results of the chamber methods. The value of each module's power was normalized by the value of the control module of the same module type, respectively. Remarkable power decrease was observed in 3 module types (C, F, J). Furthermore, though the power decrease was small in the module type B and G, they failed to pass the criteria of IEC 62804 draft. The results of the water film methods are shown in Fig. 2.

The value of each module's power was normalized by the initial value of the individual module, respectively. Remarkable power decrease was observed in 2 module types (C, F). As for module type B, it was classified as fail as one sample decreased by more than 20%.

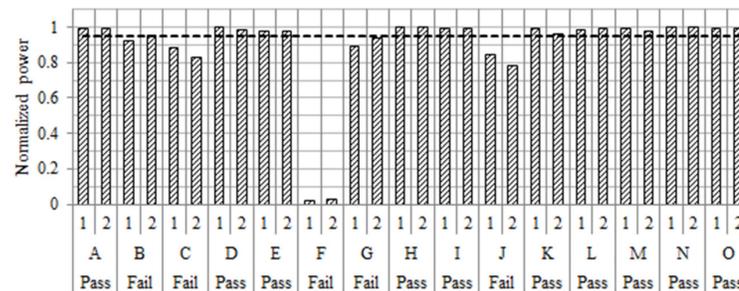


Fig. 1 Normalized power after the test by chamber method.

Table 1 Test modules.

module type	cell type	module type	cell type
A	mc-Si	I	mc-Si
B	mc-Si	J	mc-Si
C	mc-Si	K	mc-Si
D	Thin film	L	Thin film
E	mc-Si	M	mc-Si
F	sc-Si	N	mc-Si
G	mc-Si	O	mc-Si
H	sc-Si		

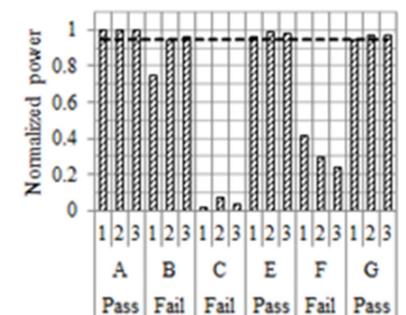


Fig. 2 Normalized power after the test by water film method.

DISCUSSION

In Fig. 3, in order to compare the results of two test methods, the average values of normalized module's power after chamber method test were plotted against those after the water film method test. In this figure, the broken line shows perfect correlation between two test methods. The retention of power after PID tests could be classified into four types; (1) Hardly decreased in both methods (module type A and E), (2) Decreased a little in the test of at least one method (module type B and G), (3) Perfectly lost of power generation function in the water film method (module type C) and (4) Perfectly lost of power generation function in the chamber method (module type F).

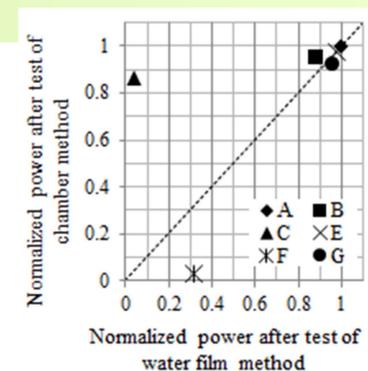


Fig. 3 Comparison between the chamber method and the water film method.

CONCLUSION

From these results, it was found that water film method not always gave more stress than chamber method because one module type showed larger degradation with chamber method than with water film method. Another important finding was that some module types show different PID degradation behavior by different test methods.

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