

And the control variable should related to blade number Z but not only Z because there is a exception, Impeller R1-4A with blade number 16 which is close to 17, almost all the six correlations are failed on it. Comparing the figure 2 and 3, the Stodola's equation is good at this impeller and also match trend of the test value line. We found that the Equivalent blade number

$$Z_{eq} = Z \sin \alpha_2 \cos \beta_{2b} \quad (9)$$

Which derived from Stodola's correlation can

represent the control variable. The equivalent blade number includes almost all the basic geometry parameters involving blade number, exit inclination angle and exit blade angle which are the main variables in the slip factor correlations for the radial flow impeller. Table 3 is a list of Z and Z_{eq} .

The impeller R1-4A has Z_{eq} value of 10.6 and less than MFI-1's value of 15, so we can draw a conclusion that various slip factor correlations will get the same result

Table 3

Compare data of Z and Z_{eq}

Impeller	R1-6A	R1-5A	R1-1	R1-4A	MFI-1	MFI-2	RD-100	Compbel
Z	4	5	6	16	17	18	18	22
Z_{eq}	1.2	1.5	1.8	10.6	15	16	17	21

while $Z_{ep} \geq 11$.

Important information got from the Figures 2 and 3 is that blade number, impeller exit inclination angle and exit blade angle of mixed-flow impeller are dominated over slip factor. The main difference between Qiu's correlation and the other correlations is Qiu referring to blade turning rate and flow coefficient. Figure 4 compares the test data with Qiu's results under four situations: (1)original correlation, (2)correlation with inclination angle correction (MZ), (3) correlation without blade turning rate and no

flow coefficient (noTurning), (4) correlation without blade turning rate and flow coefficient under inclination angle correction (no Turning MZ).

Figure 4 indicates that calculation results have maximum of 0.05 deviations from test data under the situation of without considering of blade turning rate and flow coefficient. This means blade turning rate and flow coefficient have to be taken into account for more exact solution. That's why Qiu's correlation agrees better with test data than other correlations.

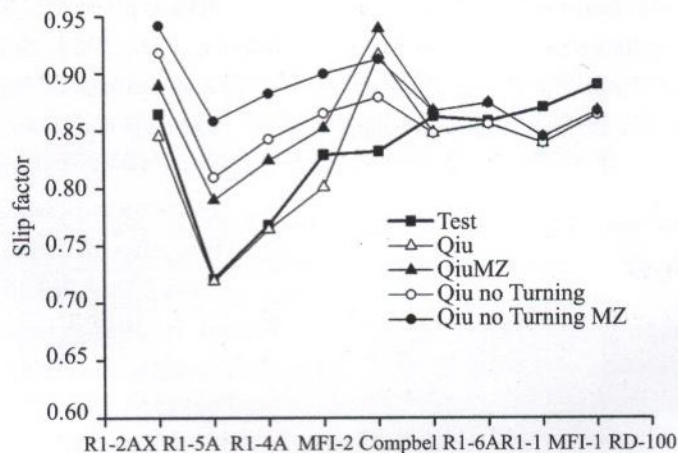


Fig. 4. Slip factors of Qiu's correlation under four situations comparing with test data.