

# Determination of the Foam Stability of Beer Using the NIBEM-T Meter

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on behalf of the **Analysis Committee**  
of the **European Brewery Convention**

## Introduction

In the 86th Analysis Committee Meeting held in Zurich in November 1997 it was decided that a collaborative test should be carried out. The EBC Analysis Committee has conducted trials on the NIBEM method, but was unable to accept the method due to the high precision figures obtained.

At the EBC Symposium in 1998 a study was presented regarding the influence of different external factors in the determination of the foam stability using the NIBEM meter. From this study a new model of instrument – the NIBEM-T – was developed. The NIBEM-T is protected against the influence of air movement and it also has automatic temperature compensation.

A new collaborative test has been carried out to compare the new NIBEM-T meter with the old NIBEM meter.

For each type of instrument, 11 laboratories participated in the test. Additional information was requested concerning the air pressure and the relative humidity during testing in order to evaluate their influence in the determination of foam stability.

## Experimental

The organization of the collaborative trial and the statistical treatment of the data were performed according to the International Standard ISO 5725.

In this trial the NIBEM and NIBEM-T meter were tested with 5 different beers bottled without nitrogen, with

Table I. NIBEM foam stability (sec).

### NIBEM

Laboratory	Beer A		Beer B		Beer C		Beer D		Beer E	
A	250	260	248	243	191	188	169	154	301	296
B	261	264	262	266	-	-	164	167	262	259
C	286	290	285	279	229**	231**	218**	208**	304	287
D	292	294	294	286	216	214	178	171	331	337
E	253	259	246	258	200	198	165	164	288	291
F	241	239	205*	246*	201	192	143	140	274	278
G	273	255	279	271	199	201	163	166	322	315
H	273	264	271	255	193	198	148	158	287*	255*
I	265	252	261	261	193	200	155	153	297	304
J	273	274	277	271	210	204	167	160	318	316
K	247	245	253	252	200	195	162	168	286	284

### NIBEM-T

Laboratory	Beer B		Beer A		Beer C		Beer D		Beer E	
L	258**	244**	255	255	196	187	158	163	296	288
M	271	275	267	271	198	197	161	160	314	316
N	274	270	266	265	181	194	169	175	311	318
O	260	265	263	265	200	190	161	150	306	314
P	279	276	279	280	212	205	171	169	327	327
Q	269	263	264	273	202	204	173	173	300	292
R	275	273	268	273	206	213	166	170	307	314
S	272	277	277	271	207	203	175	177	328	323
T	270	274	269*	248*	200	198	163	157	312	310
U	278	277	276	270	207	207	169	173	327	331
V	272	265	270	273	208	195	171	168	309	321

\* Rejected as Cochran's test statistical outlier

\*\* Rejected as Grubbs test statistical outlier

Table II. Summary of precision data.

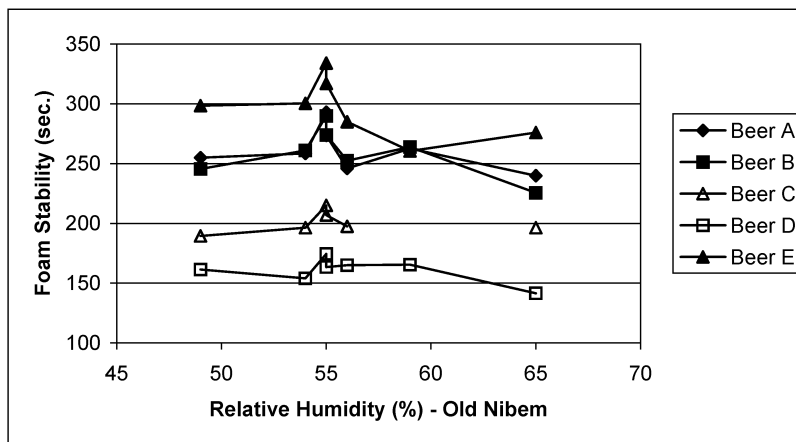
NIBEM

	Beer A	Beer B	Beer C	Beer D	Beer E
n	11	10	9	10	10
Average	264	266	200	161	298
STDev	16.14	14.19	7.37	9.08	21.65
r <sub>95</sub>	16.33	15.86	10.16	13.87	13.86
R <sub>95</sub>	46.64	41.30	21.86	27.25	61.41
CVR%	2.21	2.13	1.82	3.08	1.66
CVR%	6.31	5.55	3.91	6.05	7.37

NIBEM-T

	Beer A	Beer B	Beer C	Beer D	Beer E
n	10	10	11	11	11
Average	272	269	201	167	313
STDev	4.83	6.61	7.11	6.63	11.69
r <sub>95</sub>	8.79	9.05	15.13	9.77	13.12
R <sub>95</sub>	14.87	19.58	22.61	19.82	34.03
CVR%	1.15	1.20	2.69	2.09	1.50
CVR%	1.95	2.60	4.03	4.24	3.88

NIBEM



NIBEM-T

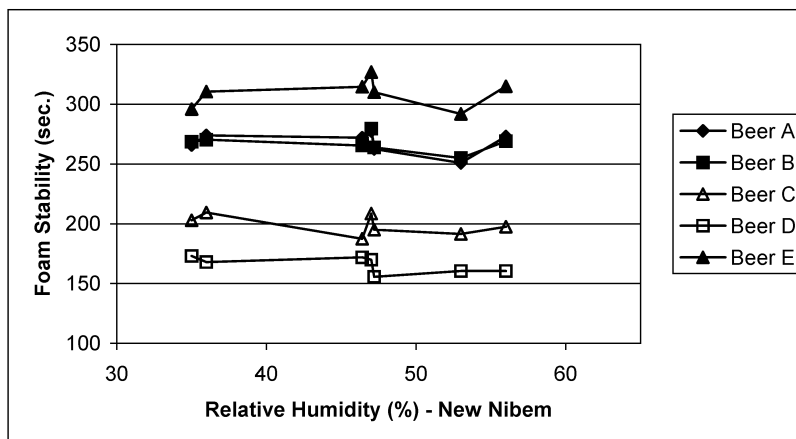
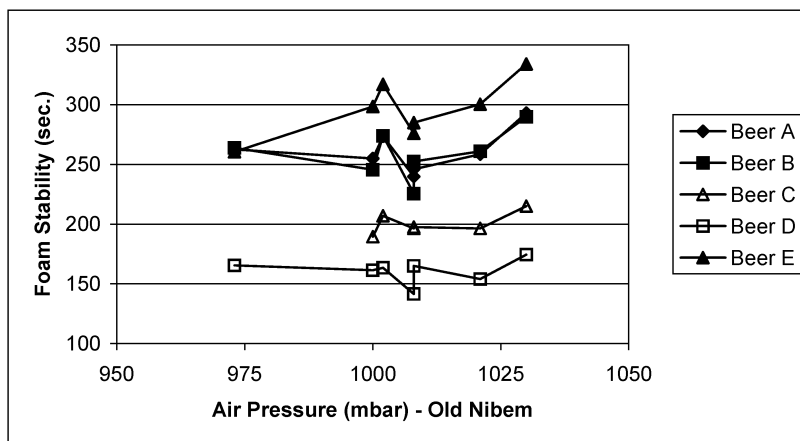


Fig. 1. Influence of the relative humidity on the foam stability.

## NIBEM



## NIBEM-T

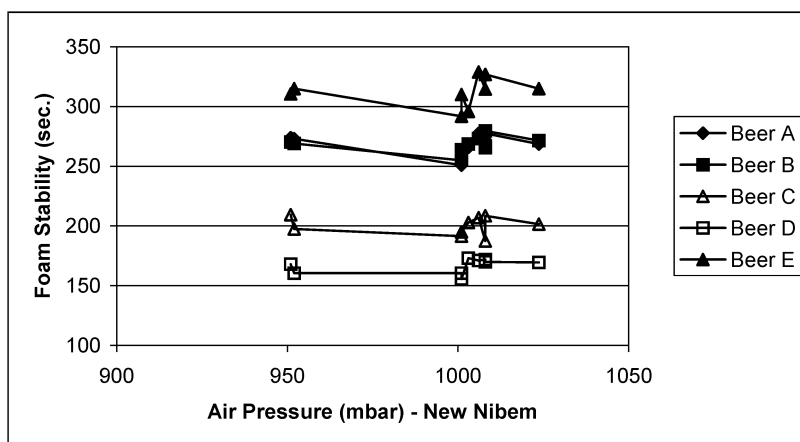


Fig. 2. Influence of the air pressure on the foam stability.

CO<sub>2</sub> contents greater than 3.4 g/L and a range of foam stability values between 160 s and 310 s. Two bottles of each beer sample were sent to each laboratory.

## Results and Discussion

Original data from the collaborative trial is given in Table I. Six outliers were detected and excluded from the calculations.

Precision data are summarized in Table II. Repeatability and reproducibility were calculated excluding the outliers and were considered satisfactory for the NIBEM-T meter: Their values are as follows:

Repeatability: NIBEM –  $r_{95} = 14.02$   
NIBEM-T –  $r_{95} = 11.17$

Reproducibility: NIBEM –  $R_{95} = 39.69$   
NIBEM-T –  $R_{95} = 22.18$

Analyses of the air pressure and the relative humidity effects on foam stability are given in Fig. 1 and 2; neither were found to have a significant influence in the determination of the foam stability.

## Conclusion

Repeatability ( $r_{95}$ ) and reproducibility ( $R_{95}$ ) results for the determination of the foam stability in beer by NIBEM-T meter are acceptable. The EBC Analysis Committee has included this method in Analytica-EBC.

## BIBLIOGRAPHY

International Standard ISO 5725, 1994.  
F.J.J. van Akkeren, Factors which influence the reproducibility of the foam stability analysis, Monograph 27, EBC Symposium Beer Foam Quality, Amsterdam, October 1998.