

Please send this report to the Secretary of the European Mechanics Council, Professor Bengt Lundberg, School of Engineering, Uppsala University, Box 534, S-751 21 Uppsala, Sweden, within one month after the Colloquium.

General

Euromech Colloquium No: 296
Title: Real Gas Effects in High Entahly Flows
Co-Chairmen: -
Place and country: Göttingen, Germany
Dates: 08.- 10. Sept. 1992

Finance

The conference fee 0 included * 0,- DM for presenters
Funding: Donations + DLR-funding
Accomodation (type and cost): Hotels
Meals: Canteen + Reception

Participation

Total number of participants: 41

Distribution of participants by country:

Code	Country	Number	Code	Country	Number
A	Austria	_____	IRL	Ireland	_____
B	Belgium	_____	LT	Latvia	_____
BG	Bulgaria	_____	LV	Lithuania	_____
CH	Switzerland	_____	N	Norway	_____
CS	Czechoslovakia	_____	NL	Netherlands	<u>2</u>
D	Germany	<u>22</u>	P	Portugal	_____
DK	Denmark	_____	PL	Poland	<u>2</u>
E	Spain	_____	R	Rumania	_____
EE	Estonia	_____	S	Sweden	_____
F	France	<u>6</u>	SF	Finland	_____
GB	Great Britain	<u>1</u>	YU	Yugoslavia	_____
GR	Greece	_____	CIS	CIS	_____
H	Hungary	_____		Australia	<u>3</u>
I	Italy	_____		U.S.A.	<u>2</u>
			J	Japan	<u>3</u>

Is there need of another colloquium on the same subject? Which year? _____

Scientific Report

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Real gas effects in high enthalpy flows.

1. Scientific discussions

The topics discussed at the colloquium were divided into the following categories:

- External flows
- Internal flows
- Facilities
- Instrumentation
- Real gas modelling.

The majority of presentations at the colloquium described experimental work, although the numerical component of the experiment evaluation was also well covered. The topic with the largest number of contributions was about the facilities for real gas flow studies. Here two kinds of facilities for creating high enthalpy flows were discussed:

- electrically heated gas flow
- shock heated gas flow.

The electrically heated facilities can create very high specific enthalpies, albeit at relatively low densities. The electric arc heated high enthalpy facilities are generally used for testing high temperature effects on materials. The real gas effects are significant in terms of chemical reactions at the gas/solid interface, which are naturally influenced by the state the gas arrives at the surface.

When higher densities at high specific enthalpies are required, shock tubes or shock tunnels are used. There are a number of new high enthalpy shock tunnels in planning, in the process of being commissioned or recently commissioned, which provided some very interesting inputs for discussion during the colloquium. In shock tunnels/tubes the loss processes in the driven part of the facilities continue to intrigue the operators of the facilities.

Along with the results from the new facilities new instrumentation developments for the study of real gas effects in high enthalpy flows were described. It is obvious that in this particular development the conventional aerodynamicists and scientists with training in physical chemistry are working closely together. This is a prerequisite for gaining further insights into the real gas effects.

A number of the presentations discussed comparisons between experiments and numerical calculations. It was made clear that some sort of spectroscopically obtained information of the flow (e.g. temperatures, species densities) is essential for a quantitative comparison of results. It is also a required type of information when the modelling of the gas behaviour (reaction rates) at high enthalpies has to be validated.

2. Participants

A list of participants including their country of origin is included. Not all are European.

3. Financial arrangements

The Colloquium attendance was free of charge to those participants who presented a paper. Other participants (i.e. second authors and participants without a paper) were requested to contribute toward the cost of the meeting a fee of 100.- DM. Further help was obtained from two companies in Göttingen (300.-DM each). The reception at the end of the technical visit to Lambda-Physics was funded by the above company.

The participants had to cover their own lodging and meal expenses (except for the two receptions). The two Polish participants obtained funding to cover those costs from the Robert-Bosch-Foundation in Stuttgart, Germany.

The balance between the cost of the Colloquium and the fees obtained was covered by the DLR High Enthalpy Tunnel Project in Göttingen.

4. Opinions/suggestion.

The Chairman has the impression that the title of the Colloquium, real gas effects in high enthalpy flows, was either too narrow or not uniformly understood.

The number of suggested participants by the Euromech correspondents did not yield a significant number of potential participants in the Colloquium. With a few exceptions most of the participants were personally known to the Chairman. This of course, since the participants were also largely known to each other, resulted in a lively and open atmosphere for discussions.

It also transpired that while the majority of the participants, invited by the Chairman, were considering similar phenomena, a few participants were considering lower enthalpies than the one assumed by the Chairman as the high enthalpy range. **Suggestion:** encourage the chairman to provide a precise definition of the scope of the Colloquium he envisages already in the preliminary announcements.

5. Conclusions

Although this Chairman had the honour of organising a Euromech Colloquium for the first time and, due to the inexperience, considered such an effort as a high workload, in hindsight this Chairman can say that it was a worthwhile effort and after recovering from this effort will willingly consider a similar effort again. The atmosphere of such a small Colloquium is very conducive for real exchange of thoughts and information.

G. Eitelberg