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Report no.:	Client document no.:	Number of pages:
RP-VessFire-03		6

Report title:
Cold Blowdown using VessFire

Summary:

Some example on calculations performed by use of *VessFire* has been listed. The results show reasonable good agreement with the experiments and calculations performed by use of other calculation tools.

Rev. no.	Date	Prepared by	Revised by	Approved by	Cause for revision
00	05-08-14	GB			Issued for information

1 Cold Blowdown

This cold blowdown experiment was performed in 1992 by M.A. Haque et all, ref. 1. The data and compared results are copied from M. Mahgerefteh and S.M.A. Wong, ref. 2.

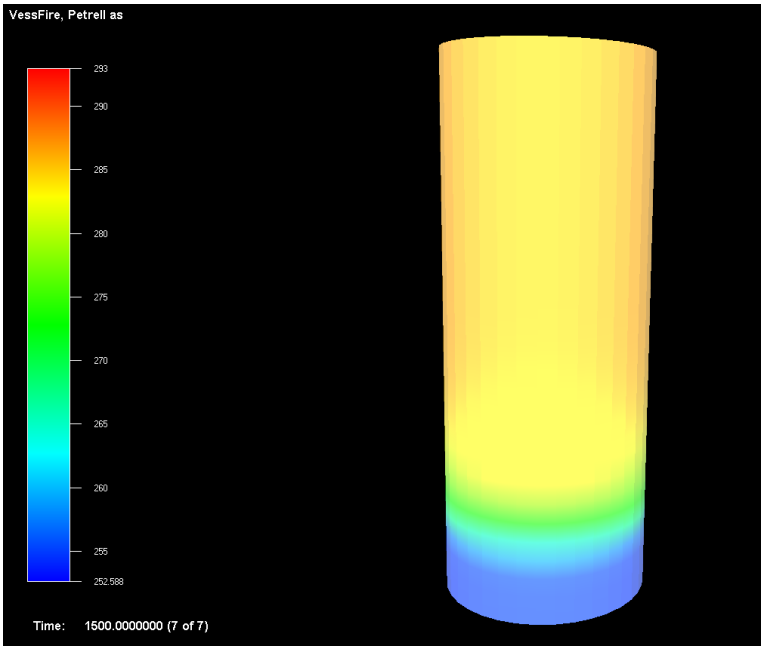

Figure 1 **Temperature plot of the 3-dimenional model of the vessel applied in calculations. The temperature variation is after 1500 secounds.**

According to ref. 2 the experiment is performed on a vertical full-size suction scrubber with given inside diameter of 1.130 m and length 3.240 m (2.75 m tanto-tan). The wall thickness was 0.059 m. The inside composition was a gas mixture with molfraction C1 0.64, C1 0.06, n-C3 0,28, n-C4 0,02. The initial conditions where: pressure 116 atm and temperature 293 K. The equivalent choke diameter was 10 mm. The results are described below. The figures includes comparisons between experiments, VessFire version 1.2, ref. 4 and 5 and Blowdown by M.A. Haque et al. ref. 3.

The experiment is not to well documented, but it is assumed that the wall temperature of the scrubber initially has the same temperature as the gas and that the environmental conditions are calm air with a temperature similar to the scrubber shell temperature. As seen from Figure 1 there is a variation of temperature in the shell dependent on location. There is minor information where the shell temperature is measured.

VessFire calculates 3-dimensional temperature profiles for the shell. The steel temperatures presented here by VessFire is the average with respect to the wall thickness. VessFire seeks the lowest and the highest average temperatures in the shell. The highest will be located in the gas zone and the lowest is located in the liquid zone.

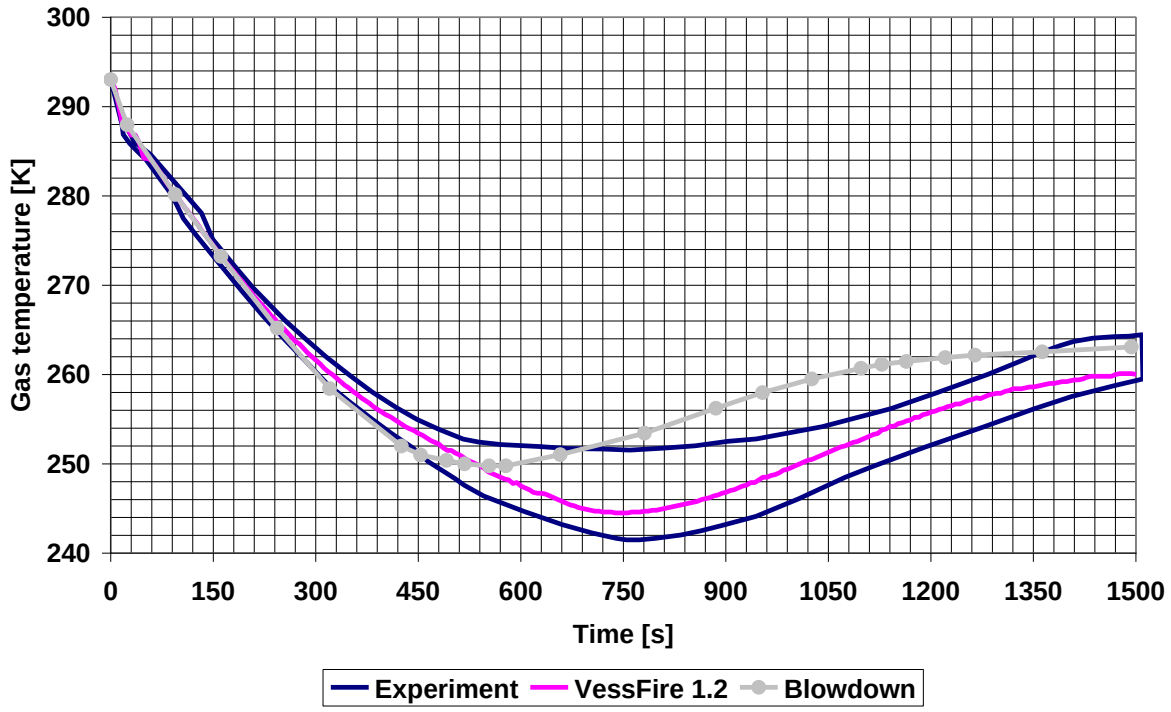

Figure 2 **Gas temperature as function of time during cold blowdovn of gas. The blue lines indicate the span of the measured temperature.**

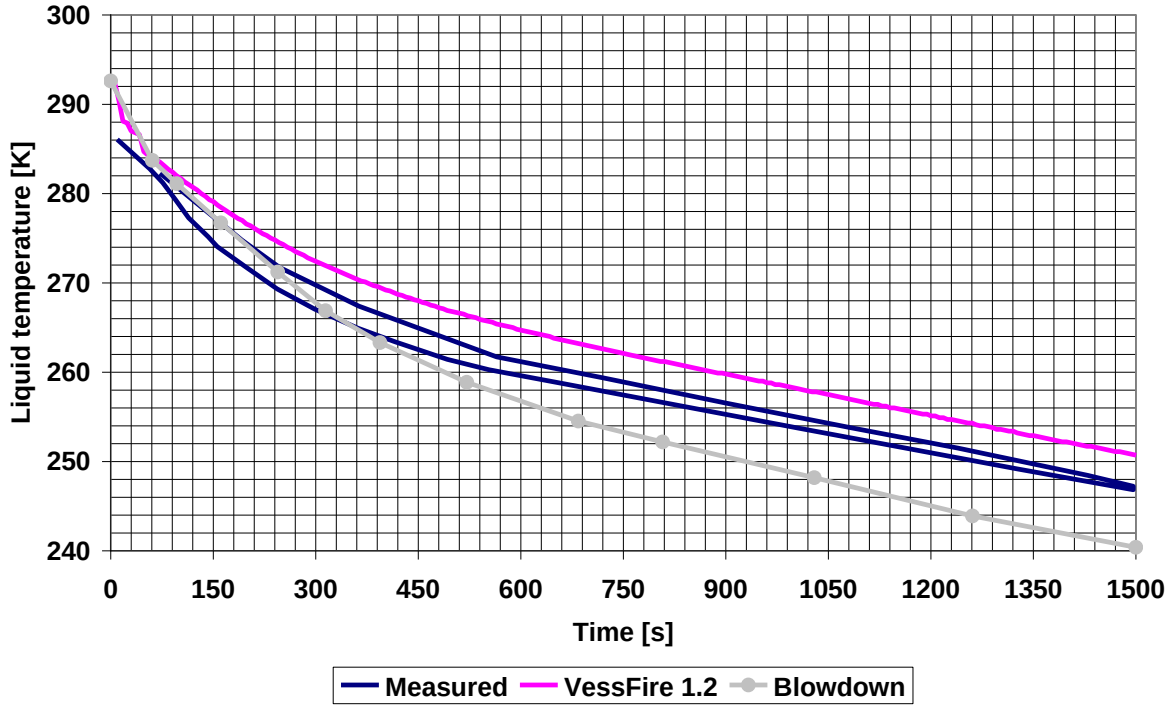

Figure 3 **Liquid temperature as function of time. Comparison between measurements and calculations.**

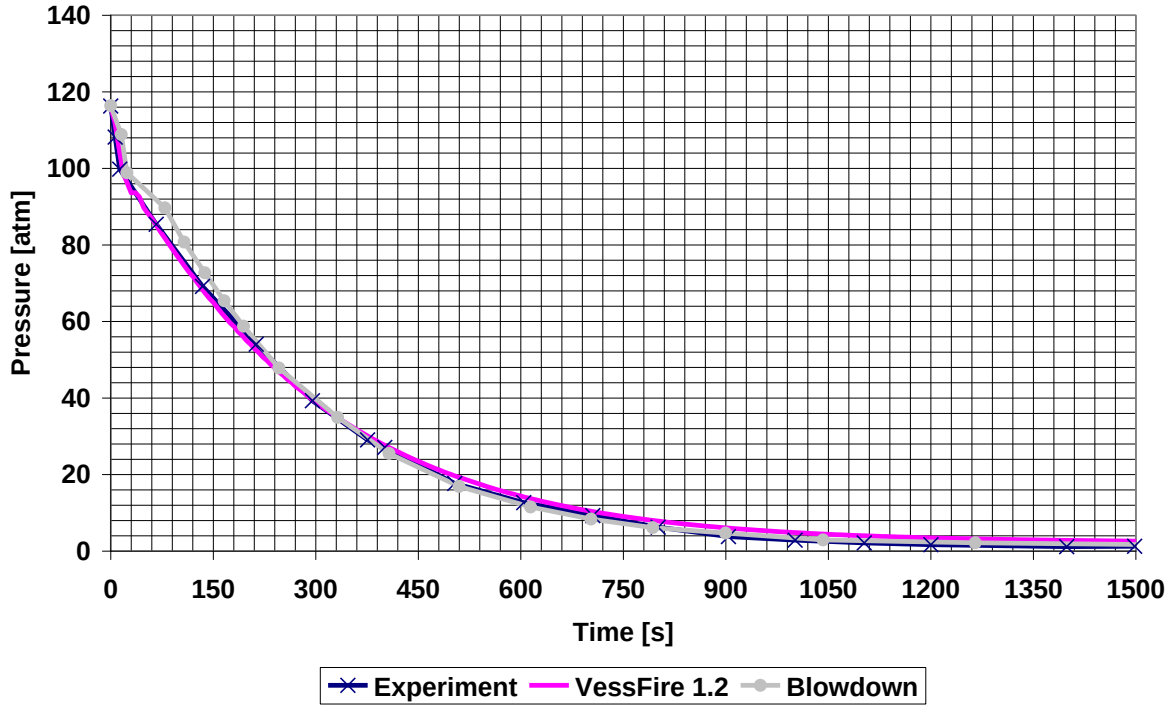

Figure 4 **Pressure as function of time for the cold blowdown. Comparison between measurements and calculations.**

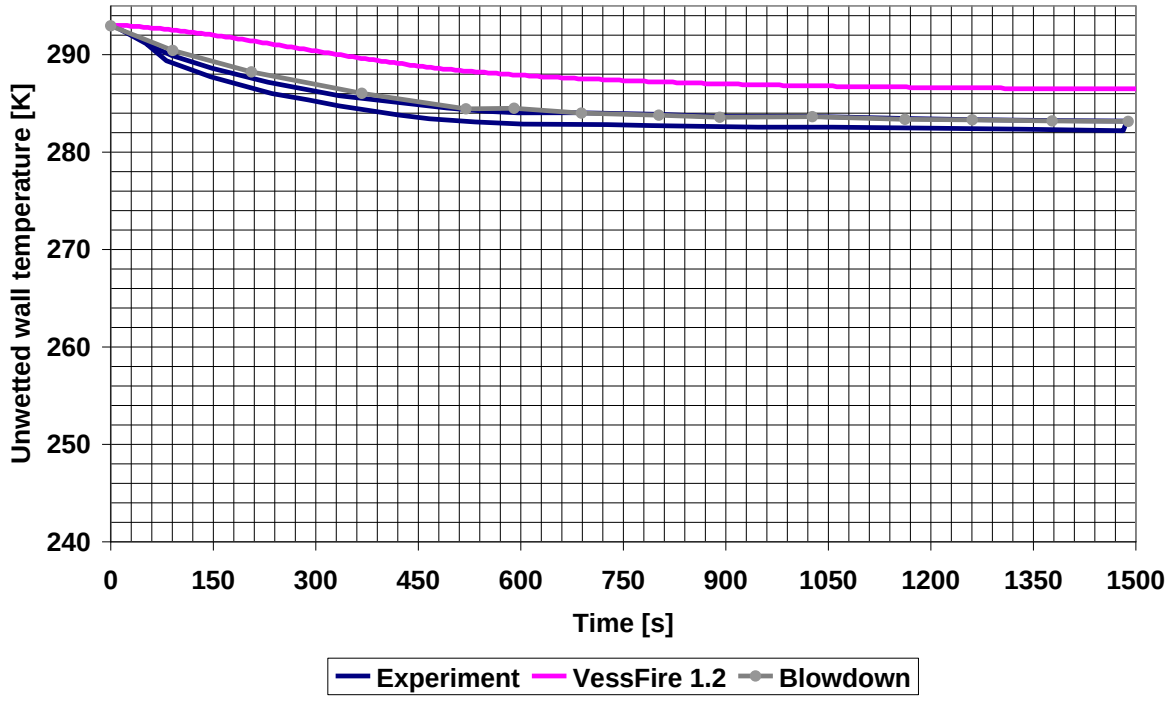

Figure 5 **Unwetted wall temperature as function of time. Comparison between measurements and calculations.**

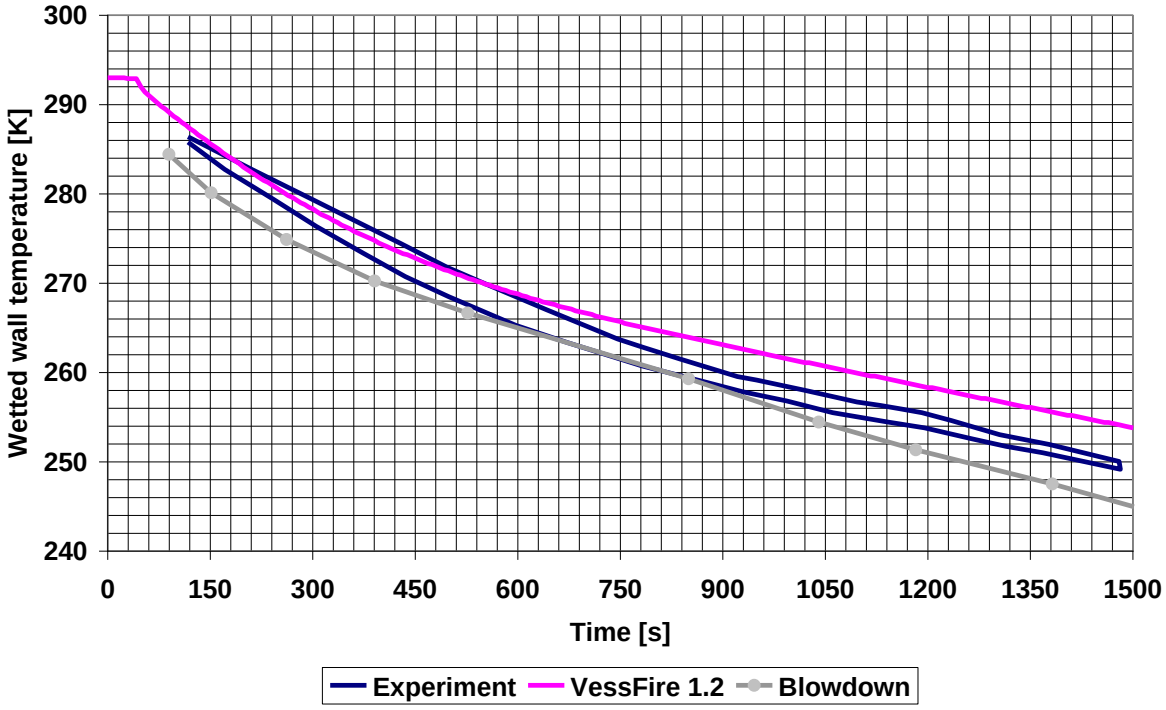

Figure 6 **Wetted wall temperature as function of time. Comparison between measurements and calculations.**

2 References

1. M.A. Haque, S.M. Richarson, G. Saville, G. Chamberlain and L. Shirvill, "Blowdown of pressure vessels. II. Experimental validation of computer model and case studies." Transactions of the Institute of Chemical Engineers Part B: Process Safety Environment Protection, 70(BI), 10-17. (1992)
2. H. Mahgerefteh, S.M.A. Wong, "A numerical blowdown simulation incorporating cubic equations of state." Computers and Chemical Engineers 23(7999) 1309-1317.
3. M.A. Haque, S.M. Richarson, G. Saville, "Blowdown of pressure vessels. I. Computer model." Transactions of the Institute of Chemical Engineers Part B: Process Safety Environment Protection, 70(BI), 1-9. (1992)
4. *VessFire* User Manual. Geir Berge, Petrell as
5. *VessFire* Technical Manual. Geir Berge, Petrell as