

Cerulean and the work of CORESTA

Cerulean, Milton Keynes, UK

The work of CORESTA

Improving metrology within the tobacco industry requires engagement with the widest possible community of professionals in the industry. CORESTA (Co-operation Centre for Scientific Research Relative to Tobacco) is an organisation that promotes scientific co-operation and to which Cerulean belongs, contributing to groups concerned with E-cigarettes, Physical test Methods, Routine Analytical Chemistry, Special Analytes and Smokeless tobacco.

There are two key activities that CORESTA engages with, the organisation and supervision of proficiency tests and the development and adaptation of standards for tobacco product measurement.

The former provides a benchmark for where the community currently is regarding metrology and where improvements are needed in methods or equipment. In the realm of physical test measurements Cerulean is engaged with an ongoing program of ensuring that transfer standards are measured consistently by all the laboratories providing this service to the customer base. Underpinned by physical principles extraordinarily close agreement can be achieved between laboratories.

This is critical when this is translated to actual physical measurements where upwards of 20 different enterprises will measure standards and specially made samples to gain an idea of the repeatability and reproducibility of physical measurements across the industry. Cerulean is a participant and also has a keen interest if any of the Cerulean made machines involved in the tests exhibit any bias or greater variability than comparable machines.

The development of standards is critically important to the industry as often CORESTA developed standards become the basis of internationally recognised standards, the ISO standards. Cerulean is proud to be involved in the development of ISO standards as expert advisors via our national standards bodies and also in some cases leading working groups for ISO.

In each of these cases, the development of standards and maintaining proficiency, the activities we undertake are underpinned by an understanding of the science of measurement. But this is not always straight forward. CORESTA needs to be aware of the changing landscape for regulation and this can bring challenges that must be responded to. One such challenge concerns the standardisation of smoke yields when smoking under different regimes.

Problem Solving

In 2013 the Routine Analytical Chemistry group undertook a comprehensive study of a monitor test piece smoked under ISO and Intense conditions (2011 collaborative study of CORESTA monitor2 #6 (CM6) and #7 (CM7) published in 2012). Whilst the ISO measurements were as expected the more intense method noted a peculiar stratification of results based on the machine type, in fact Rotary smoking machines gave a lower yield of TPM, NFDPM, and water. The TPM yield was more than 13% lower on a rotary machine when compared with a linear smoking machine. Cerulean undertook to examine this phenomenon to understand the causes behind this.

Intense smoking fundamentally produces more particulate matter and more water than ISO smoking and it is this that highlights the difference between the two machine types.

A series of experiments were conducted using linear smoking machines and a special rotary smoking machine designed by Cerulean that allowed the capture pad to be located in the conventional position for a rotary machine – remote from the smoking port – or at the butt end of the test piece as would be found in a linear smoking machine.

By smoking the same products this approach showed that the yield formed from smoking was identical on this smoking machine to a linear smoking machine but some if the particulate phase was not reaching the capture pad when placed in the “normal” remote location under intense smoking conditions.

As this distance was varied between the butt end and capture pad we can see that the total particulate matter yield dropped.

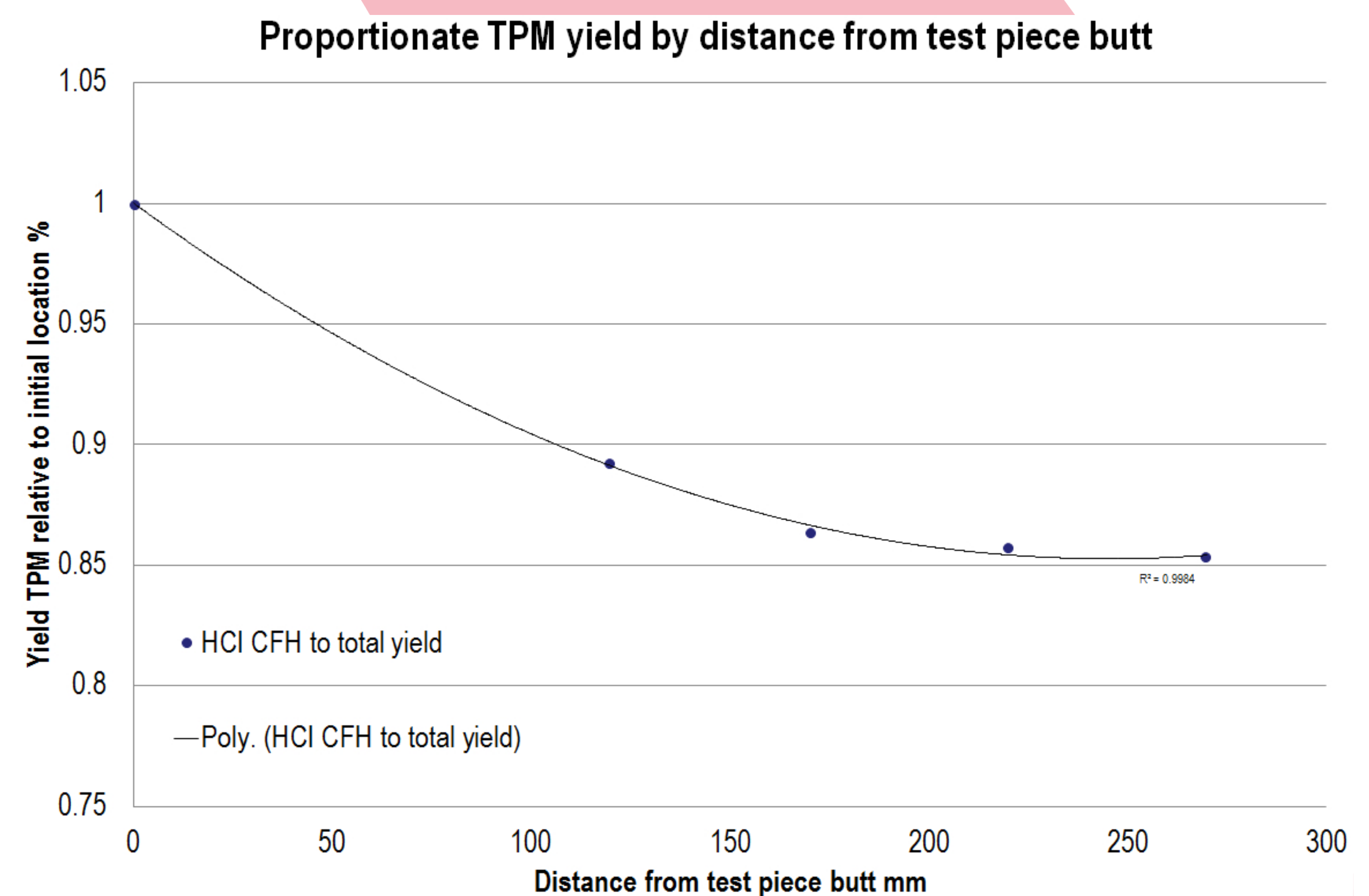


Fig1: % Yield change as a function of distance between cigarette butt and capture pad

Further tests showed that the neoprene washer, which is included in TPM calculations for linear machines but not for rotary machines, makes a small but avoidable 1% contribution to TPM weight errors under intense smoking. There was also a contribution in error from desorption of water from the capture pad based on the number of puffs taken although this was small. Finally the exact process of “wiping” out the holder can add to errors in TPM measurement and calculation unless both sides of the holder are wiped and not just the front half.

The outcome of this was greater understanding when making comparisons between laboratories but also to improved machine design. The original Cerulean rotary machine was modified to produce a minimal dead volume rotary smoking machine – the ORBIT20 - which gives identical yields for smoked products under intense and ISO conditions as seen from the table below.

Intense smoking Regime TPM / mg			
Product under test	SM450 linear smoking machine	ORBIT20 NEW Cerulean Rotary smoking machine	% Difference in yield ref CORESTA study -13% lower for rotary
3R4F	42.7	42.5	-1%
CM8	42.8	40.7	-5%
Sample P	47.0	48.1	+3%

The Future

Cerulean continues to work with CORESTA to understand fully the metrology of smoking and tobacco products and is committed to a future pushing back the boundaries of understanding.



Fig 2 : ORBIT20 and improved low yield loss rotary smoking machine