M11 EGR Test

Presentation to
HDEOCP
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David M Stehouwer

David M Stehouwer, Cummins Inc.

Evaluation of Beaded Filters

○ **Concern over number and spacing of pleats**

○ **Questionable used filters returned to FG**

○ **Statistical sampling (36) of 550 filter batch returned to FG**

○ **Perform flow vs. restriction**

○ **Examine extremes for pleat count and spacing**

○ **Perform dust capacity testing on extremes**

○ **Refer to O&H Panel**

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Analysis of Returned Filters by Fleetguard

Oil	Filter	# Pleats	Area Cm2	Gm/100 cm2	Total Contamina Gm
E	A	61	5243	2.00	105
E	B	55	4727	1.65	80
E	MCD1 Even			1.6971	
E	MCD1 Bunched			1.3855	
E	MCD1 Average	59	5071	1.5413	78
E	MCD7 Even			0.9663	
E	MCD7 Bunched			0.8132	
E	MCD2 Average	56	4813	0.88975	43
Test	Even			4.7729	
Test	Bunched			4.4734	
Test	Average	60	5157	4.6232	238

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Observations from Filter Analysis

○ **Pleat count is from 55 to 61 with a target of 55 min.**

○ **Bunched pleats do remove slightly less material, but...**

○ **Bunched pleats can remove a lot of deposit with less variation than expected**

○ **The relationship with sludge ratings and filter deposits suggests that when an oil exceeds its capacity to hold sludge, it comes out all over the engine… filter, pan, valve covers etc.**

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Flow vs. Restriction for Reference Filters

○ **Analysis of 34 filters reference filters**

Flow vs Restriction

$R^2 = 0.9998$

Restriction: kPa (y-axis)

Gallons per Minute (x-axis)
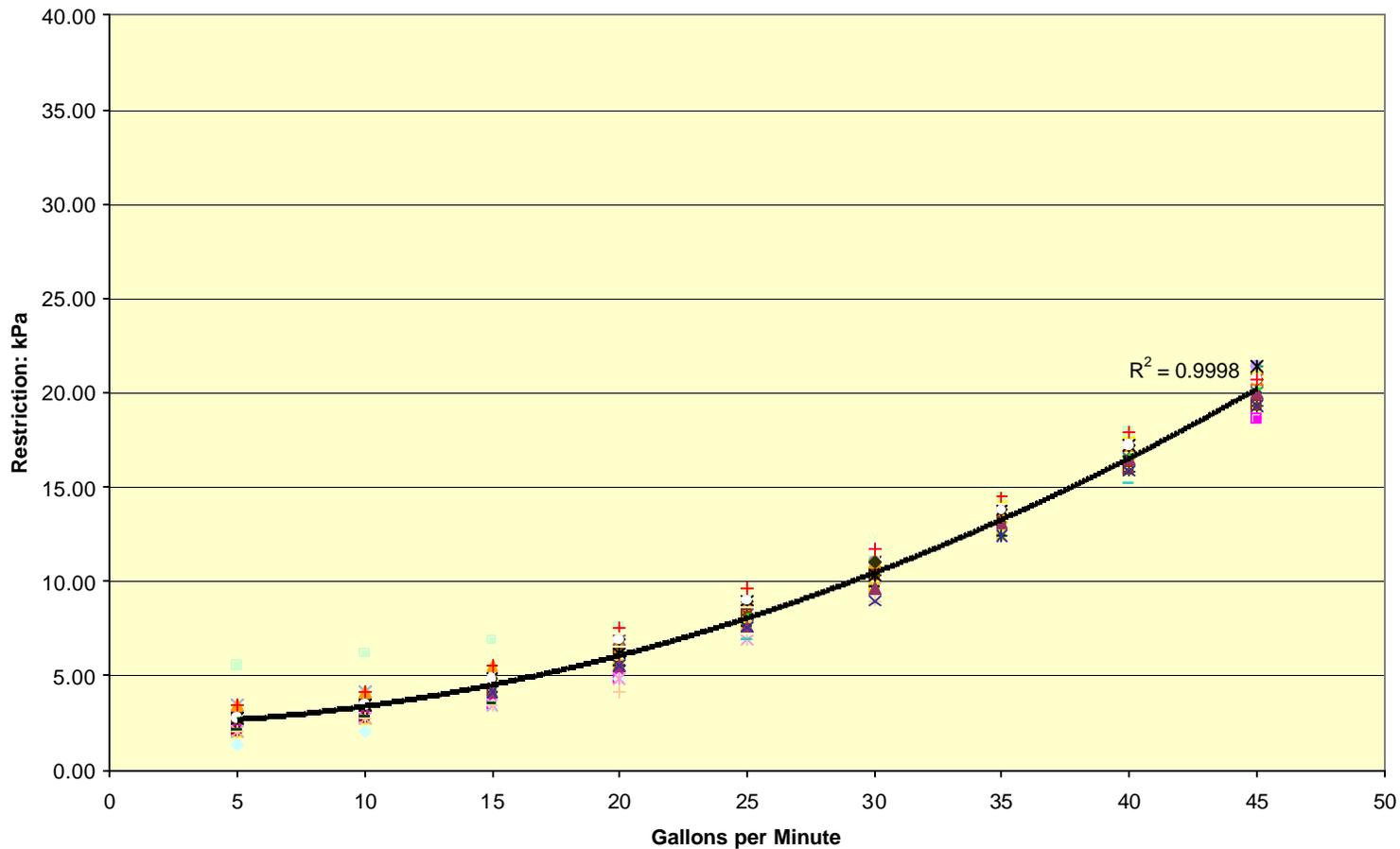
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Flow vs. Restriction for Reference Filters

○ **Showing M11 EGR Filter Plugging Limit**

Flow vs Restriction
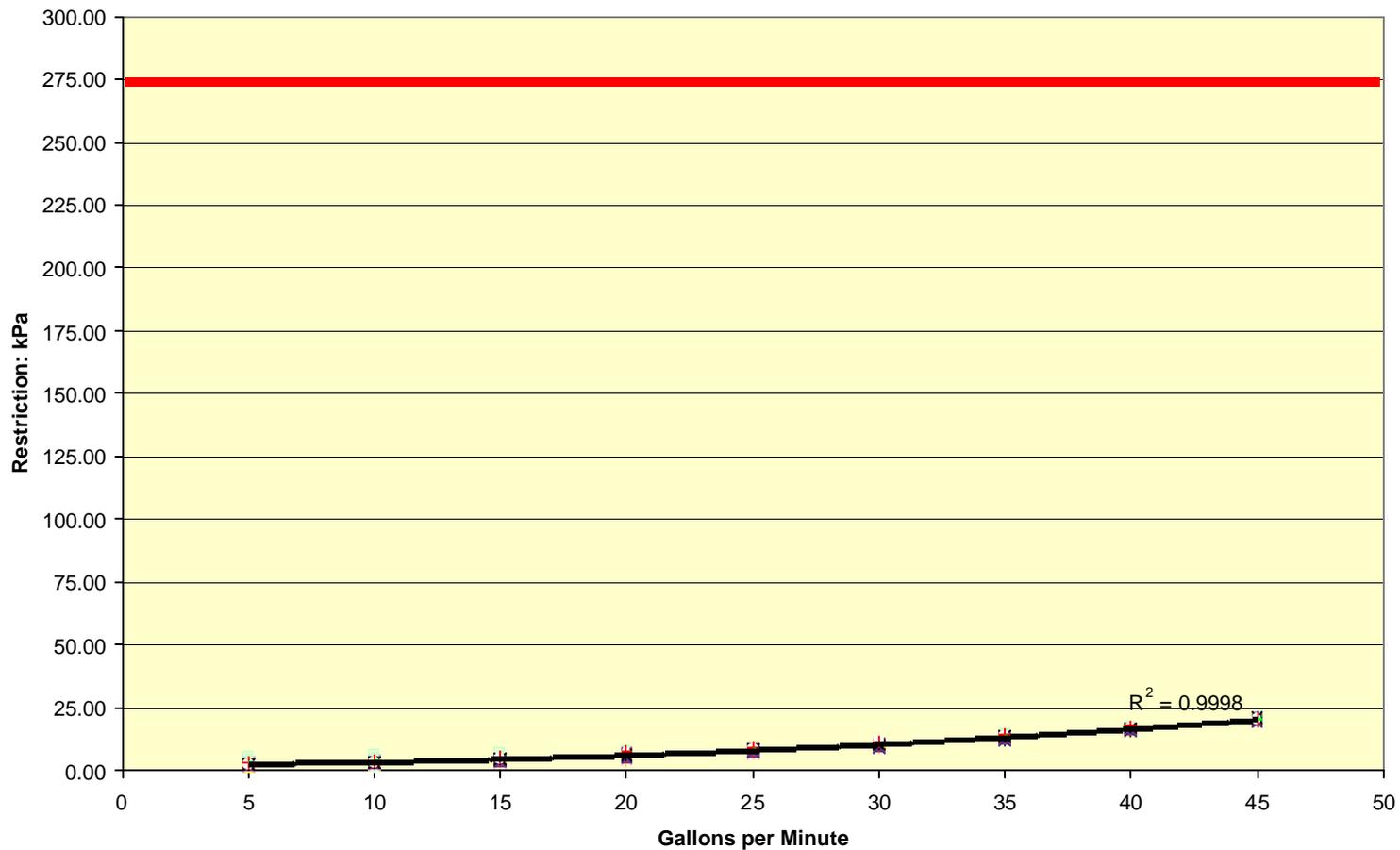
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Improvement in Consistency

○ **Comparison of 1st 14 matrix runs using unbeaded filters with lab result on beaded filters. Mean +/- 1 sd.**

**Improvment in variability
of Initial Filter Restriction**

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