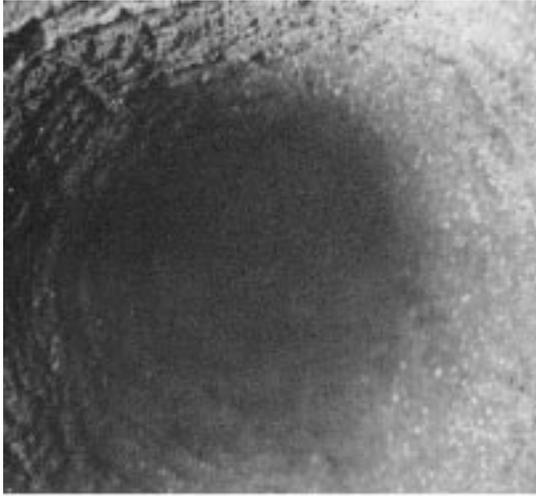




SVENSKT STÅL



CASE STUDY: COKE OVEN GAS OXELÖSUND SWEDEN



HEAVY BUILDUP – View directly upstream of the V-cone flowmeter.

APPLICATION:

COKE-OVEN GAS, a byproduct from the coke production mill, is used as the main fuel for the rolling mill ovens at SSAB. The coke-oven gas contains a number of problem constituents such as naphtha, ammonium hydrate, and tar. These gas constituents typically separate from the gas and build up on the inside of piping and other process line components.

THE PROBLEM:

Flow monitoring of coke-oven gas is difficult due to solids buildup on interior surfaces. Heavy accumulation often renders venturis, orifice and segmental orifice plates incapable of accurate flow measurement. In addition, the pressure-sensing ports of venturi or orifice plate flowmeters become plugged, making the readings of these primary differential pressure devices difficult, if not impossible.

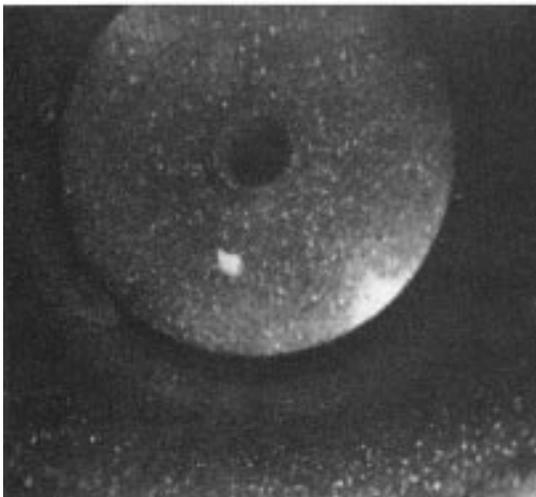
THE SOLUTION:

A 150mm diameter V-cone Differential Pressure Flowmeter with a full-scale range of 110mm water column was selected for evaluation by Svenskt Stal Oxelosund. Mr. Lekberg, Instrument Engineer for SSAB, was responsible for the installation and evaluation of the V-cone. After one month of continuous flow, Mr. Lekberg reported, “We had the meter installed for one month and then inspected it together with ANSKO (the local McCrometer representative), and to our surprise, the meter was clean and had no obvious wear on the cone. The performance of the meter was also excellent and to our full satisfaction.” It was decided to put the V-cone to an even more rigorous test and leave it on line and operating for another two full months to see if the V-cone would continue to operate as well and to see if any wear on the cone could be detected. At the end of the three months of testing, Mr. Lekberg stated that, “I may now say after these months of testing that the V-cone has performed better than we had expected and no sign of wear on the cone has been found although our gas is heavily contaminated.”



CLEAN MEASUREMENT AREA (BETA REGION) – View of the V-cone element looking upstream (high pressure region) to downstream.

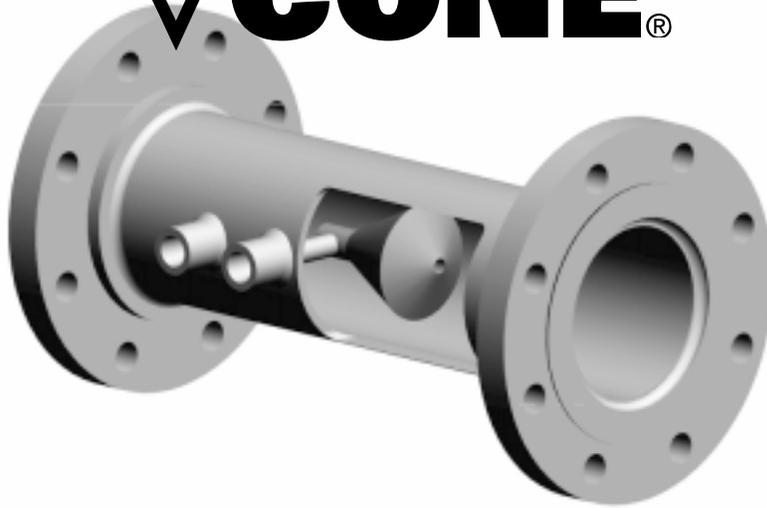
The V-cone overcame the two primary problems in the measurement of coke-oven gas; the build-up of material and subsequent change in beta ratio and the clogging of the differential pressure measurement ports. This is accomplished by the V-cone due to its unique cone element which interacts with and re-profiles the flow velocity upstream of the cone. This not only creates an optimum flow profile but creates a pressure zone upstream that prohibits the formation of contaminant build-up and thereby maintains a constant beta ratio. Since the high-pressure measurement port is also located in this pressure zone, it too remains clean and free from build-up. As the cone creates a controlled turbulence area around and downstream of the cone, this area remained free of contaminant build-up and kept the low-pressure measurement port clean.



FREE FROM BUILDUP AND WEAR – View of the low pressure port and downstream face of the cone itself.

The V-cone at SSAB continues to operate, providing accurate flow data of coke-oven gas, free from the effects of gas contaminants that prevented other differential pressure measurement devices (as well as other technologies) from operating successfully.

√CONE®



APPLICATION DATA

FLUID TYPE: COKE-OVEN GAS
MASS: 4.4000E-01 SG (60F)
VISCOSITY: 1.2000E-02 C-POISE
kE: 1.36000

	MIN	WRK	MAX
FLUID TEMP (degree C)	35	45	60
LINE PRESS (bar G)	0.08	0.1	0.105
FLUID FLOW (scm/h)	80	300	743

CALIBRATION PARAMETERS:

LINE SIZE: 150mm SCH 40 (ID=154.38mm) **BETA:** 0.44
FULL SCALE DIFFERENTIAL PRESS: 11.11cm H₂O

APPLICATION RANGE (TURNDOWN): 9:1

LINEAR VELOCITY: 1.19 to 11.06m/s
REYNOLDS NUMBER: 8119 to 75404

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