An Introduction of a New Flow Number Determination Method

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## Flow Number

Flow number test is a testing for measure the rutting resistance of hot mix asphalt pavement. It came from a very simple concept: applying a repeated loading to a asphalt cylinder every one second and record the deformation of the sample. At the beginning of the loading, deformation accumulates very fast and then the rate of deformation slows down due to the densification of sample. This is called the primary stage. After the sample was fully compacted, the rate of deformation will stay without changing. This is called secondary stage. As the deformation continues accumulating and reaches a failure point, the rate of deformation starts increasing again. This is called the tertiary stage. The load cycle which the tertiary stage starts is defined as the flow number. Flow number is an indication of asphalt material’s ability to resist deformation at high temperatures.

## Problem Statement

Determining the corresponding load cycle of where the tertiary stage starts is very confusing because the recorded deformation at each load cycle is very random. Traditionally, asphalt engineers take the lowest strain rate as the point where the third stage starts. However, there are usually many load cycles all have the minimum strain rate. Determining which one is the flow number is very dependent to personal judgment. Developing a new flow number determination method that different asphalt engineers could have the same flow number result for the same lab results is very desirable.

## Project Idea

Define X as the act of recording the number of load cycles. It is not a random variable. Define Z as the act of recording the strain occurred during the corresponded X. We will try to develop a third or fourth order linear model and take the derivative of the derivative to determine the flow number.