Please fill in the name of the event you are preparing this manuscript for.	2020 International Petroleum Technology Conference
Please fill in your 5-digit IPTC manuscript number.	IPTC-20205
Please fill in your manuscript title.	The Effect of Steel Production Infrastructure on Controlled-Source Electromagnetic Surveys: Implications for Reservoir Monitoring

Please fill in your author name(s) and company affiliation.

Given Name	Surname	Company
Andrei	Swidinsky	Colorado School of Mines
Gurban	Orujov	Colorado School of Mines
Ethan	Anderson	Colorado School of Mines
Rita	Streich	Shell
Lifei	Liu	Shell

Abstract

Controlled-Source Electromagnetic (CSEM) methods have the potential to be powerful geophysical tools for monitoring and tracking the distribution of electrically resistive hydrocarbons during oil and gas production. However, the presence of infrastructure (well casings, pipelines etc.) presents an enormous challenge, because the highly conductive steel masks the electromagnetic response of subsurface geology and any associated changes in the reservoir. Therefore, numerical techniques to predict and remove the contamination caused by pipelines and casings on CSEM surveys are critical for real world 4D applications.

The Method of Moments was originally used by the mineral exploration community to model the electromagnetic response of volcanogenic massive sulfide deposits as thin conductive sheets, and the technique still forms the basis of many airborne electromagnetic interpretation packages. Targets are parameterized as specific geometric shapes and represented as a distribution of secondary sources whose moments are determined through the solution to a dense matrix equation describing field interactions within the system. One advantage of the Method of Moments is its ability to describe highly conductive targets as is the situation for steel infrastructure problems, and algorithms can be custom built for rapid calculations. Within a collaborative project between the Colorado School of Mines and Shell, we have implemented a Method of Moments code that allows us to include the effect of well casings and pipelines in the modeling and inversion of CSEM data. This approach provides a good balance between required accuracy, numerical efficiency, and scalability for real field scenarios where many casings and pipelines are present. We are also aiming to validate the calculation of these effects using experimental data gathered in the lab and in the field. Early results are encouraging, showing good match between experimental and modeled data. We will discuss this novel method for modeling steel infrastructure and show how we have validated our approach against other numerical and real data.