

RELATIONSHIPS AMONG WELL PRODUCTIVITY,  
WIRE LINE LOG SIGNATURES AND ROCK  
CHARACTERISTICS IN THE HYGIENE  
SANDSTONE OF THE DENVER-JULESBERG  
BASIN, WATTENBERG FIELD,  
COLORADO.

by

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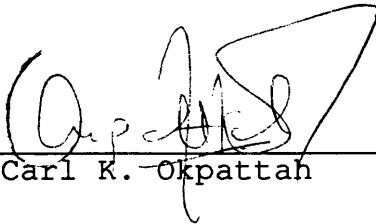
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A thesis submitted to the Faculty and the Board of Trustees of the Colorado School of Mines in partial fulfillment of the requirements for the degree of Master of Science (Geology).


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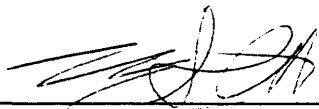
  
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**ABSTRACT**

The Campanian-age Hygiene Sandstone in the Wattenberg field is a widespread tight gas sand with facies sequences ranging from bioturbated, very fine-grained muddy sandstone to medium-grained, cross-stratified sandstone.

Net sand thickness ranges from 14 to 70 feet. Log-derived maximum average porosity ranges from 8 to 15 percent and correlates linearly with net sand thickness. This is an indication of depositional control on reservoir quality. Permeability values are very low, ranging from 0.01 to 16 md. Variation in reservoir quality is related to original environmental facies and diagenetic influences.

One of the major problems in petrophysical evaluation of sandstone sequences is accounting for the effect of clays on well log responses. It is often assumed that clay provides a conductive matrix material which causes resistivity measurements to be reduced. Cross-plots of log parameters account for the effects of clays and calcite on resistivity, porosity and gamma ray measurements in this field. The resistivity curve is almost a mirror image of the gamma ray and spontaneous potential curves. The highest

resistivities occur in the upper portion of the cross-stratified, fine-medium grained sandstone facies and are probably due to gas being present in the reservoir.

Pickett cross-plots established the formation water resistivity ( $R_w$ ) in the field to be 0.075 ohm-meter. High resistivity values of logs were not always a result of hydrocarbon presence but also of fresh water influx in the formation. Water saturation maxima is 70 percent in the intervals that produce oil and gas.

Structural interpretation of the field defines the geologic conditions for the occurrence of hydrocarbons in the Hygiene Sandstone. The Hygiene Sandstone reservoir in the Wattenberg field is compartmentalized. The faults act as seals as shown by different gas-oil ratio (GOR) values across fault blocks. The average producing life of wells in the study area is 5.3 years.

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The original material for this dissertation includes a significant number of oversized pages. The full text can be viewed by accessing the supplement file.

