Produced water analysis is a direct source of information to the subsurface processes active in an oil field. The information is, however, complex and requires a multidisciplinary approach and access to multiple data types and sources to successfully unlock and decode the processes. We apply data analytics on a combined data set of water chemistry and oil and gas production data measured in the production stream from five wells in the Halfdan field. The field is produced applying extensive water injection to ensure the most efficient water sweep of the reservoir. Relationships between daily production data and water chemistry are examined with Principal Component Analysis (PCA), and systematics with respect to predictability of daily changes in the oil production from water chemistry are examined with partial least square (PLS) regression models. For each well, the water chemistry provides a high degree of predictability with respect to daily oil cut in the production stream. The results have potential for application within prediction of sweep efficiency, by-passed oil and for prediction of water break-through. Full potential, however, depend on successful implementation of water chemistry-oil production analytics into other data domains such as seismic (4D) data and well work-over data.