To decrease or eliminate trans fatty acids in food products, alternative technological options such as interesterification, fractionation, and blending have been developed to replace the conventional hydrogenation process. Such interesterification has been applied in several studies for producing modified solid fats, which are used for butter, margarine, or shortening. Interesterification of palm stearin (PS) with liquid vegetable oils could yield a good solid fat stock that may impart desirable physical properties because PS is a useful source of vegetable hard fat, providing β’ stable solid fats. Dietary ingestion of olive oil (OO) has been reported to have physiological benefits such as lowering serum cholesterol levels, suppressing certain types of cancer, enhancing liver function, and reducing the effects of aging and heart disease. Preparation of semi-solid fats from mixtures of OO and solid fats is an alternative for the food industry, given the high oxidative stability of the product in frying situations, and the health enhancing properties of this material. The goal of this research was to conduct a detailed study of the influence of chemical interesterification on the compositions and functional characteristics of the products. Semi-solid fats were prepared by chemical interesterification using four different weight ratios of OO to PS (70:30, 60:40, 50:50, 40:60). Chemical and physical properties of the resulting products were characterized to identify potential applications of these materials. The incorporation of OO to PS increased, proportionately, the unsaturated fatty acids, which reduced consistency producing more plastic mixtures. Interesterification reduced melting and softening points of all mixtures due to the increase of triacylglycerols unsaturated produced in the modification. Changes on physical properties, such as softening point, consistency and solid fat content, after chemical interesterification were also observed by the polarized light microscopy, crystallized area reduced when blends were interesterified. The physical-chemical properties of mixtures showed to be suitable for use as shortenings by the food industry. Additionally, the blends are presented free of trans fatty acids with a reasonable amount of unsaturated fatty acids derived the olive oil.