Edible oil processing showed an increase interest in the last years as a result of new applications and improved product quality requirements. Recent developments in lipid pure compounds and mixtures property modelling allow the use of computer aided methods and tools for the edible oil industry. In this work, Shea oil solvent fractionation is designed and analysed using a systematic approach involving four steps: (1) process data collection, (2) process modelling, design and simulation, (3) process performance analysis (e.g.: energy, economic and environmental analysis), (4) process hot-spots identification and retrofit solutions. SPEED lipids database is used to provide pure compound and mixture property models, which includes the special lipids developed parameters for a wide range of UNIFAC models.