

**ENERGETSKA EFIKASNOST TERMOKOMPRESORSKIH SISTEMA  
PRIMENJENIH U INDUSTRIJSKIM KONCENTRATORIMA****ENERGY EFFICIENCY OF THERMOCOMPRESSSION SYSTEMS  
APPLIED IN INDUSTRIAL CONCENTRATORS**

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*U ovom radu su prikazana istraživanja energetske karakteristika termokompresorskih sistema primenjenih u industrijskim koncentratorima. Primenom turbokompresorske i/ili ejektorske termokompresije postiže se značajno povećanje energetske efikasnosti u poređenju sa tradicionalnim industrijskim koncentratorima. Jednostepeni centrifugalni kompresori sa vodom (R718) kao rashladnim sredstvom su posebno pogodni za primenu u koncentratorima za proizvodnju koncentrata voća ili grožđa zbog relativno male temperaturne razlike između temperature kondenzacije i isparavanja ( $T_c - T_e$ ). Ciklus toplotne pumpe u ejektorima se ostvaruje termokompresijom jednog dela otpadne vodene pare u rastvoru, koja se zajedno sa primarnom parom iz kotla, ili drugog generatora toplote, koristi kao pogonska para za proces koncentracije (koncentrovanja). Predloženo je nekoliko rešenja visoko efikasnih jednostepenih i višestepenih koncentratorskih sistema sa turbokompresorskom i/ili ejektorskom termokompresijom. Proces ključanja – isparavanje vode iz tretiranog rastvora u koncentratoru se ostvaruje na niskim temperaturama, u uslovima dubokog vakuuma, što je garancija visokog kvaliteta proizvoda. Zbog niskih troškova konvencionalnih goriva koja se koriste u procesima proizvodnje koncentrata, proizvodi napravljeni ovim postupkom su relativno jeftini, što ih čini konkurentnim na tržištu. Predstavljeno je rešenje poligenerativnog sistema za proizvodnju električne i toplotne energije (para i tople vode) za potrebe tehnoloških procesa u industrijskim koncentratorskim postrojenjima.*

**Ključne reči:** industrijski koncentratori; termokompresija; energetska efikasnost; poligeneracija; voćni koncentrat

*Investigations of the energy characteristics of thermocompression systems applied in industrial concentrators are presented in this paper. A significant increase of the energy efficiency in comparison with traditional industrial concentrators is achieved with the implementation of turbocompressor and/or ejector thermocompression. Single stage centrifugal compressors with water (R718) as a refrigerant are especially suitable for application in concentrators for production of fruit or grape concentrates because of the relatively small temperature difference between condensation and evaporation temperatures ( $T_c - T_e$ ). The heat pump cycle in the ejectors is realized with thermocompression of one part of the waste water vapor in the solution, which together with the primary steam from the boiler, or other heat generator, is used as a motive steam for the process of concentration. Several*

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*solutions of highly efficient single stage and multistage concentrator systems with turbocompressor and/or ejector thermocompression are proposed. The process of boiling – evaporation of the water from the treated solution in the concentrator is realized at low temperatures, under deep vacuum conditions, which is a guarantee for a high product quality. Due to the low costs of conventional fuels used in the processes of production of concentrate, the products made with these procedures are relatively low-priced, which makes them competitive on the market. A solution of a polygeneration system for production of electricity and thermal energy (steam and hot water) for the needs of technological processes in industrial concentration plants is presented.*

**Key words:** *industrial concentrators; thermocompression; energy efficiency; polygeneration; fruit concentrate*