

.()

$$\eta = \frac{COD}{PAC}$$

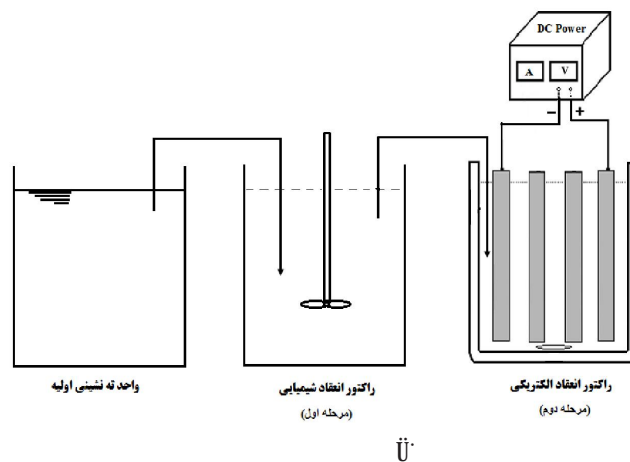
$$COD = \eta \cdot PAC$$

$$BOD_3 = \eta \cdot COD$$

.()

$$pH = \log \left(\frac{Al(OH)_3}{[Al^{3+}] \cdot [OH^-]^3} \right)$$

$$TSS = \text{Total Suspended Solids}$$



COD (DR/5000, HACH, USA)
 () (BOD₅)
 BSB-Controller Model 620 T)) Excel
 pH. ((WTW
 (Metrohm Herisau, Switzerland) E520 pH
 CONSORT C 831
 (MPN) i pH i i BOD₅, COD
 (TC) i (TSS) i (TS)
 .() (FC) .() (TKN)

استاندارد ایران	فاضلاب ته نشین شده (پس از ۲۴ ساعت)	فاضلاب خام (انحراف معیار ± میانگین)	پارامتر
--	۴۸	۴۸	تعداد نمونه‌ها
۶/۵-۸/۵	۷/۴۴ ± ۰/۱۶	۷/۳۱ ± ۰/۱۲	pH
۶۰	۴۱۵۹ ± ۲۸۱	۵۸۱۷ ± ۴۷۳	COD (mg/L)
۳۰	۲۲۰۴ ± ۱۷۷	۲۵۴۳ ± ۳۶۲	BOD ₅ (mg/L)
۶۰	۱۱۷۲ ± ۸۴	۳۲۴۷ ± ۸۴۵	TSS (mg/L)
--	۹۲ ± ۱۲	۱۳۷ ± ۱۲	TKN (mg/L)
۱۰	۳۲ ± ۷	۳۴ ± ۹	چربی، روغن و گریس (mg/L)
--	۹۰۶۱ ± ۱۴۰۰	۹۱۴۰ ± ۱۵۱۲	هدایت الکتریکی (μs/cm)
۱۰۰۰	۲/۳ × ۱۰ ^۹	۲/۸ × ۱۰ ^۹	کلیفرم کل (تعداد در ۱۰۰ mL)
۴۰۰	۱/۷ × ۱۰ ^۸	۱/۹ × ۱۰ ^۸	کلیفرم مدفوعی (تعداد در ۱۰۰ mL)

مقدار	درصد حذف آلاینده ها توسط فرایند انعقاد شیمیایی				
PAC (mg/L)	TKN	TSS	COD	BOD ₅	کلیفرم مدفوعی
۲۵	۲۶/۴۰	۴۵/۴۷	۳۶/۸۴	۲۹/۸۱	۹۹/۸۲
۵۰	۳۱/۳۰	۵۱/۷۸	۴۶/۷۵	۳۵/۵۷	۹۹/۸۴
۷۵	۳۵/۱۳	۵۶/۵۴	۵۱/۱۴	۴۰/۵۱	۹۹/۸۷
۱۰۰	۴۱/۲۶	۶۲/۸۰	۵۸/۶۶	۴۵/۸۶	۹۹/۸۷

() h

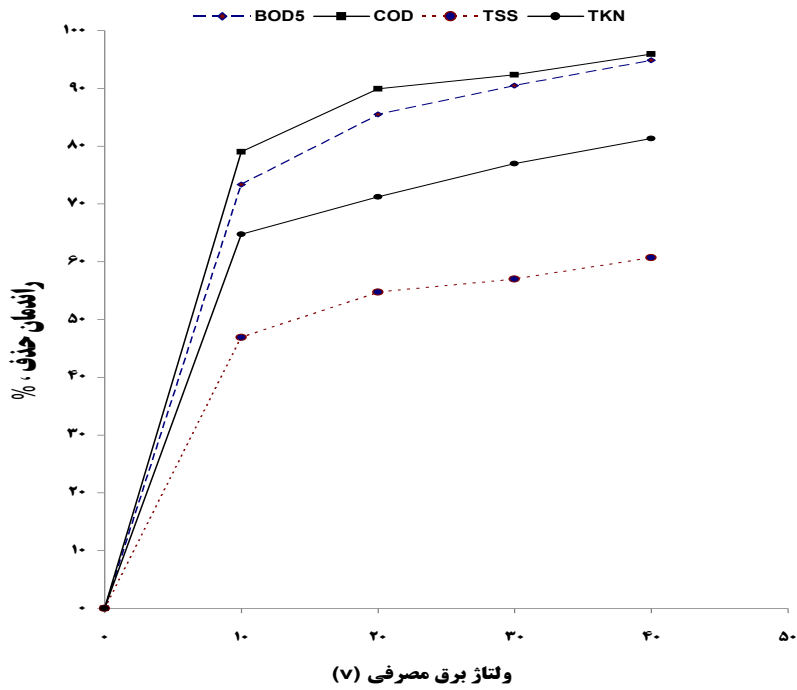
TKN ،TSS ،COD ،BOD₅)

(

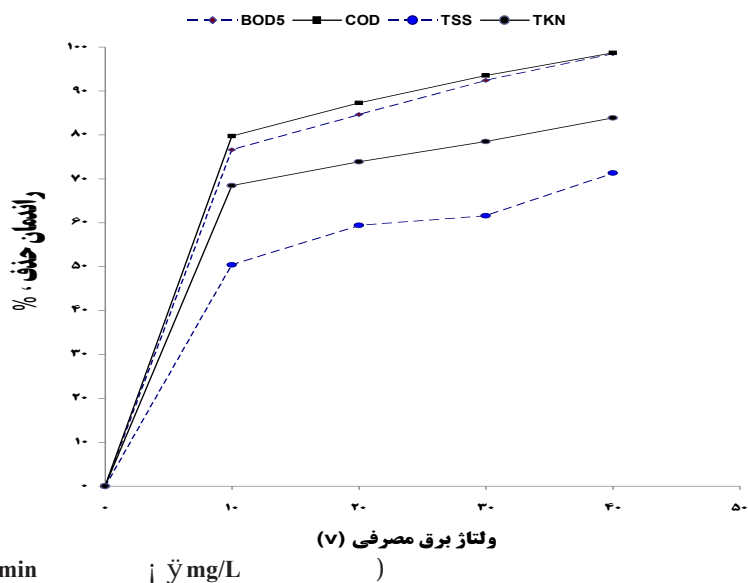
BOD₅،COD

i

i



(pH= / min i mg/L) :



i

i

(g)

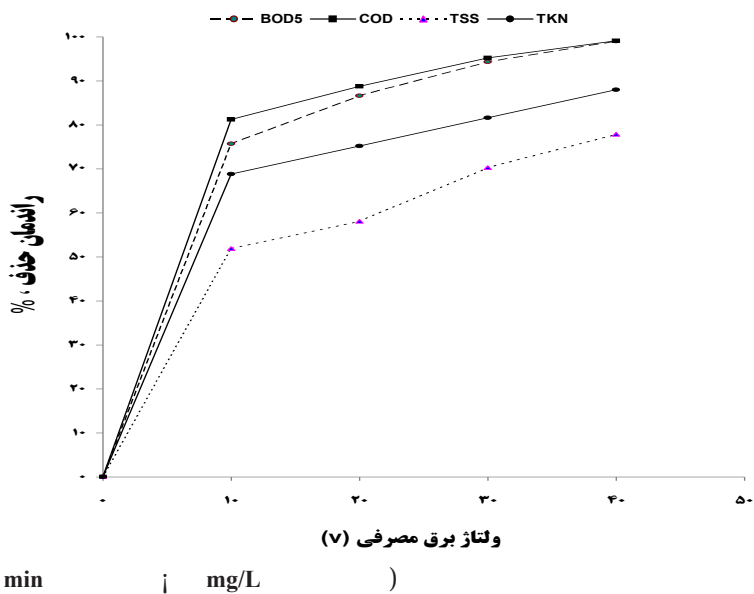
i ÿ- ÿV

Ü

i

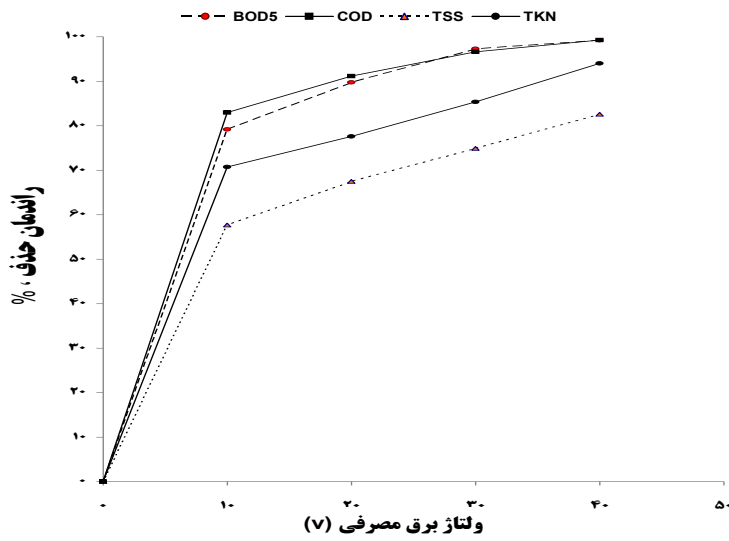
.

i



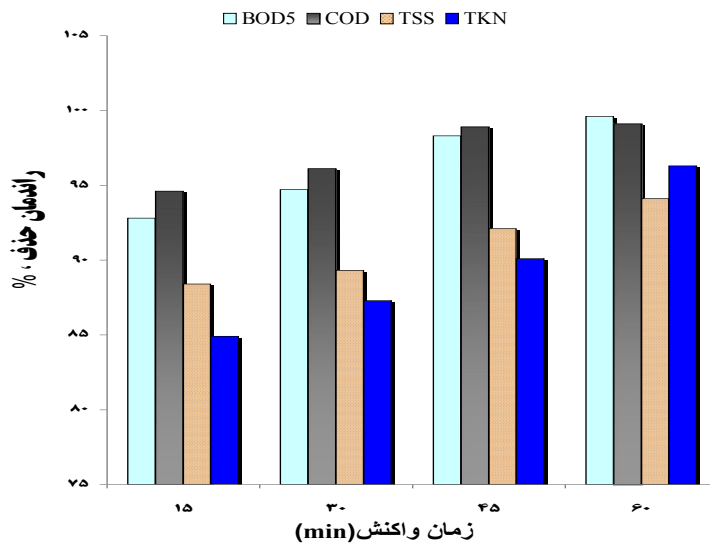
(pH= / ÿ min

i mg/L) :



(pH= / 40V) : (mg/L) i / min

یافته‌ها نشان می‌دهد که در شرایط آزمایشی، درصد حذف آلودگی در طول زمان واکنش افزایش می‌یابد. در زمان ۱۰ دقیقه، درصد حذف BOD₅، COD، TSS و TKN به ترتیب ۸۰٪، ۸۵٪، ۵۸٪ و ۷۰٪ بود. در زمان ۲۰ دقیقه، این مقادیر به ۹۰٪، ۹۲٪، ۶۸٪ و ۷۸٪ رسید. در زمان ۳۰ دقیقه، درصد حذف به ۹۵٪، ۹۸٪، ۷۵٪ و ۸۵٪ افزایش یافت. در نهایت، در زمان ۴۰ دقیقه، بیشترین درصد حذف به ۹۸٪، ۱۰۰٪، ۸۲٪ و ۹۲٪ رسید. این نتایج نشان می‌دهد که فرآیند تصفیه در این شرایط به خوبی انجام می‌شود و در زمان ۴۰ دقیقه، تقریباً تمام آلودگی‌ها حذف می‌شوند.



(pH= / 40V) : (mg/L) i / min

()
i

i

()

yV

yV

i

()

i

i

i

i

yy mg/L

yy mg/L

yV

i

yy mg/L

yV

Wang

i

()

Camci

Akbal

yy

y

()

y min (kWh/g) () :

غلظت پلی آلومینیوم کلراید (mg/L)				ولتاژ (v)
۱۰۰	۷۵	۵۰	۲۵	
۰/۰۱۱۲	۰/۰۱۰۸	۰/۰۱۰۳	۰/۰۰۹۷	۱۰
۰/۰۲۹۷	۰/۰۲۸۱	۰/۰۲۷۰	۰/۰۲۵۳	۲۰
۰/۰۵۷۰	۰/۰۵۵۰	۰/۰۵۲۴	۰/۰۴۹۵	۳۰
۰/۰۹۱۸	۰/۰۸۸۰	۰/۰۸۴۹	۰/۰۷۹۷	۴۰

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$\bar{n} / \bar{n} /$ TSS TKN
 TSS COD
 i $\bar{n} / \bar{n} /$
 $\bar{y} \text{ mg/L}$ $i \bar{y} V$
 $\bar{y} \text{ min}$

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Application of Combined Chemical Coagulation-Electro Coagulation Process for Treatment of the Zahedan Cattle Slaughterhouse Wastewater

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ABSTRACT

Background and Objectives: Slaughterhouse wastewater contains various and high amounts of organic matter (e.g., proteins, blood, fat, and lard). In order to produce an effluent suitable for stream discharge, chemical coagulation and electrocoagulation techniques have been particularly explored at the laboratory pilot scale for organic compounds removal from slaughterhouse effluent. The purpose of this work was to investigate the feasibility of treating cattle-slaughterhouse wastewater by combined chemical coagulation and electrocoagulation process to achieve the required standards.

Materials and Methods: At present study, slaughterhouse wastewater after initial analysis was tested for survey of coagulation process using Poly aluminum chloride (PAC) at various doses (25-100 mg/L). Then we measured the concentrations of wastewater pollutants (BOD₅, COD, TKN, TSS and fecal Coliforms). Later, we transferred the effluent to the electrocoagulation unit and we evaluated the removal efficiency of pollutants in the range 10 to 40 volts of electric potential during 60 min.

Results: It was found that the efficiency of chemical coagulation process using poly-aluminum chloride (PAC) as coagulant increases with increasing doses (from 25 to 100 mg/L); we achieved maximum removal efficiency during the chemical coagulation for parameters of BOD₅, COD, TSS, and TKN at 100 mg/L of PAC equivalent to 44.78%, 58.52%, 59.9%, and 39.58% respectively. Moreover, the results showed that with increasing the electric potential and reaction time, the yield increases linearly so that maximum removal efficiency at a dose of 100 mg/L PAC, an electrical potential of 40 volts and a reaction time of 60 minutes for the parameters BOD₅, COD, TSS, and TKN was 99.18% 99.25%, 82.55%, and 93.97% respectively.

Conclusion: The experiments demonstrated the effectiveness of combined chemical coagulation and electrocoagulation processes for pollutants removal from the slaughterhouse wastewaters. Consequently, this combined process can produce effluent compliance with the effluent discharge standards.

Keywords: Chemical coagulation, Electro coagulation, Slaughterhouse wastewater treatment

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