CHELATING AGENTS MANAGEMENT TO OBTAIN TCF BLEACHED *Eucalyptus grandis* KRAFT PULPS II: APPLYING SELECTED SEQUENCE TO INDUSTRIAL PULPS

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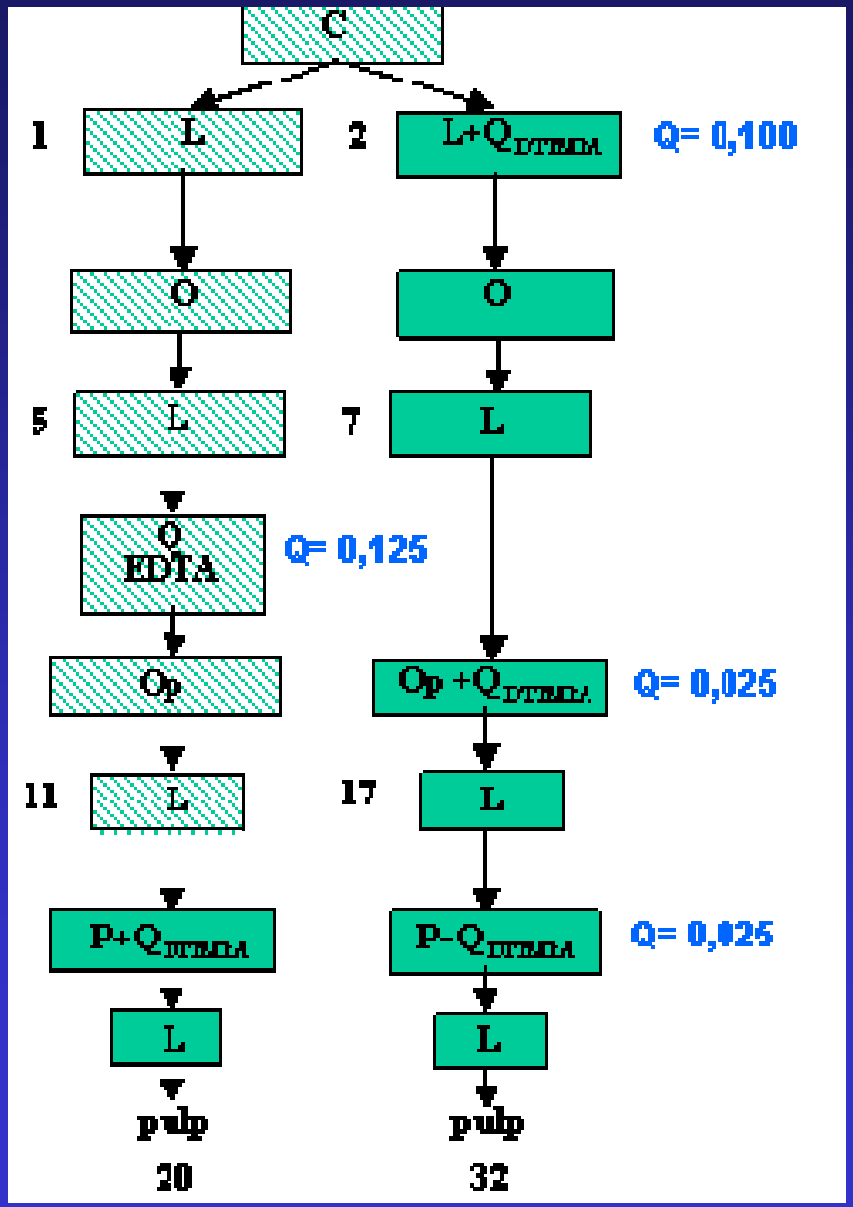
SCOPE

- **This article presents conclusions of works carried out using:**
  - **Industrial pulps from Celulosa Argentina S.A.**
  - **Sequences of chlorine free (TCF) bleaching**
  - **Process sequence (O-Q-Op-P) selected from previous works**

OBJECTIF

- Comparison of bleaching sequences with:
  - DTPMPA incorporation in different stages and without a Q stage
  - EDTA in a Q stage and DTPMPA in the P stage
- Some explanations to differences found are provided.

STUDIED ALTERNATIVES OF *Eucalyptus* TCF INDUSTRIAL PULPS



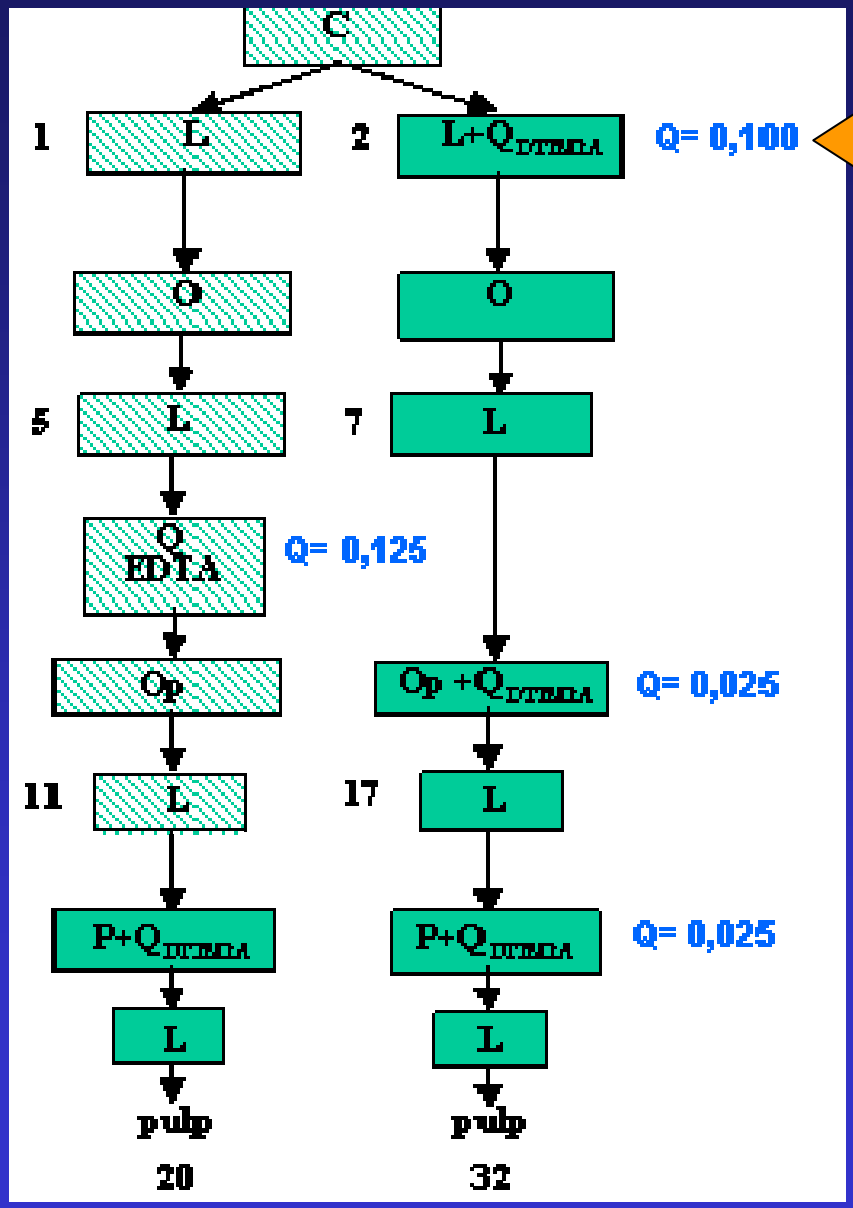
EXPERIMENTAL

- Studied sequences (20 and 32) were selected on the base of a previous work involving 34 options.
- Results of the control treatment (sequence 19), including only a Q EDTA stage were remarkably poor.
- Then, a similar sequence, with DTPMPA addition in P stage (pulp 20) was chosen as the contol.

EXPERIMENTAL

- *Eucalyptus* (*grandis* 95%) Kraft pulp, provided by Capitán Bermúdez mill of Cellulose Argentina, was used as raw material.
- Phosphonates (DTPMPA) were provided by Solutia Inc.

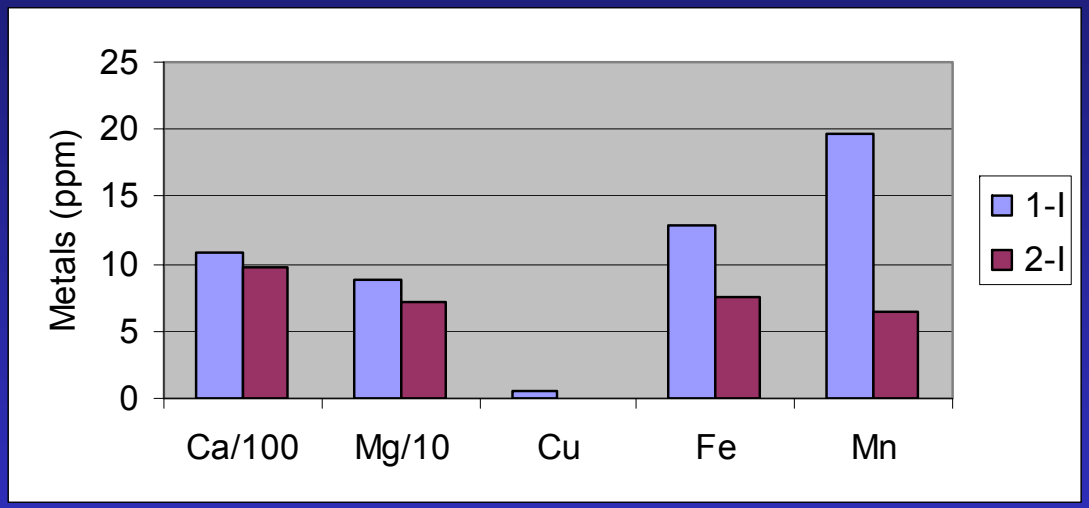
RESULTS: UNBLEACHED KRAFT PULPS



RESULTS:
UNBLEACHED KRAFT PULPS

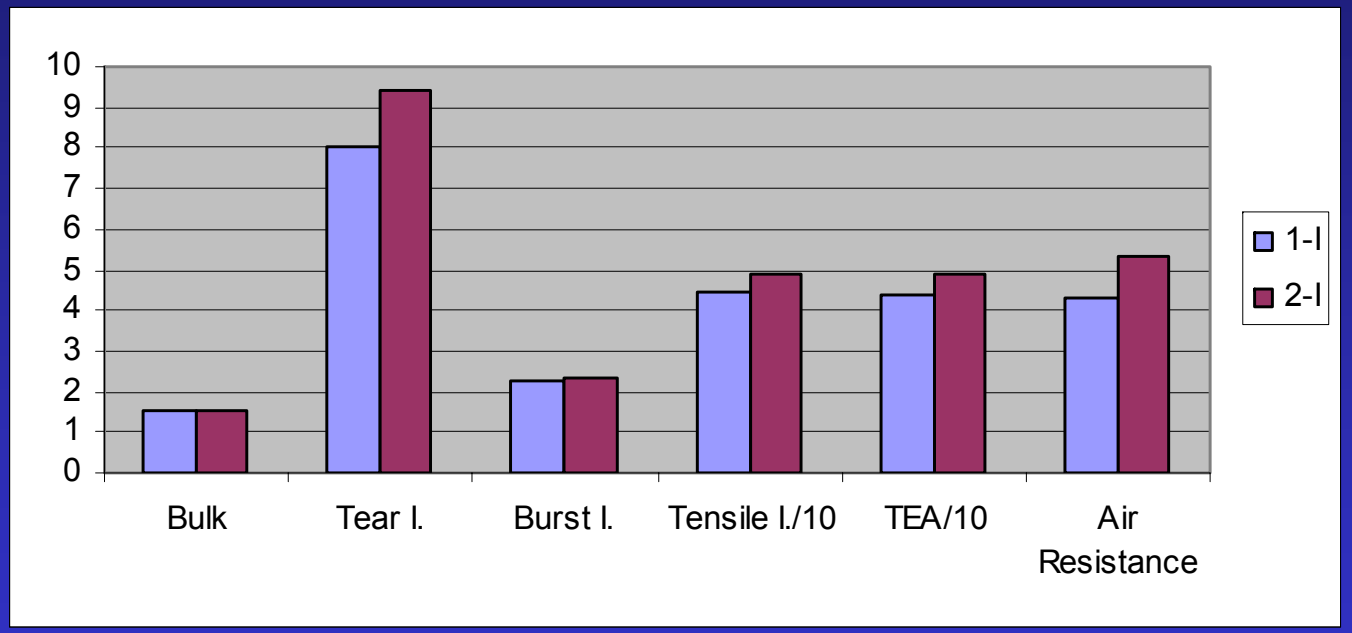
- There are no significant differences between pulps UBK 1 and UBK 2 (brown stock pulps washed without and with DTPMPA) in industrial pulps considering:
  - Viscosity
  - Kappa number
  - COD

RESULTS:
UNBLEACHED KRAFT PULPS



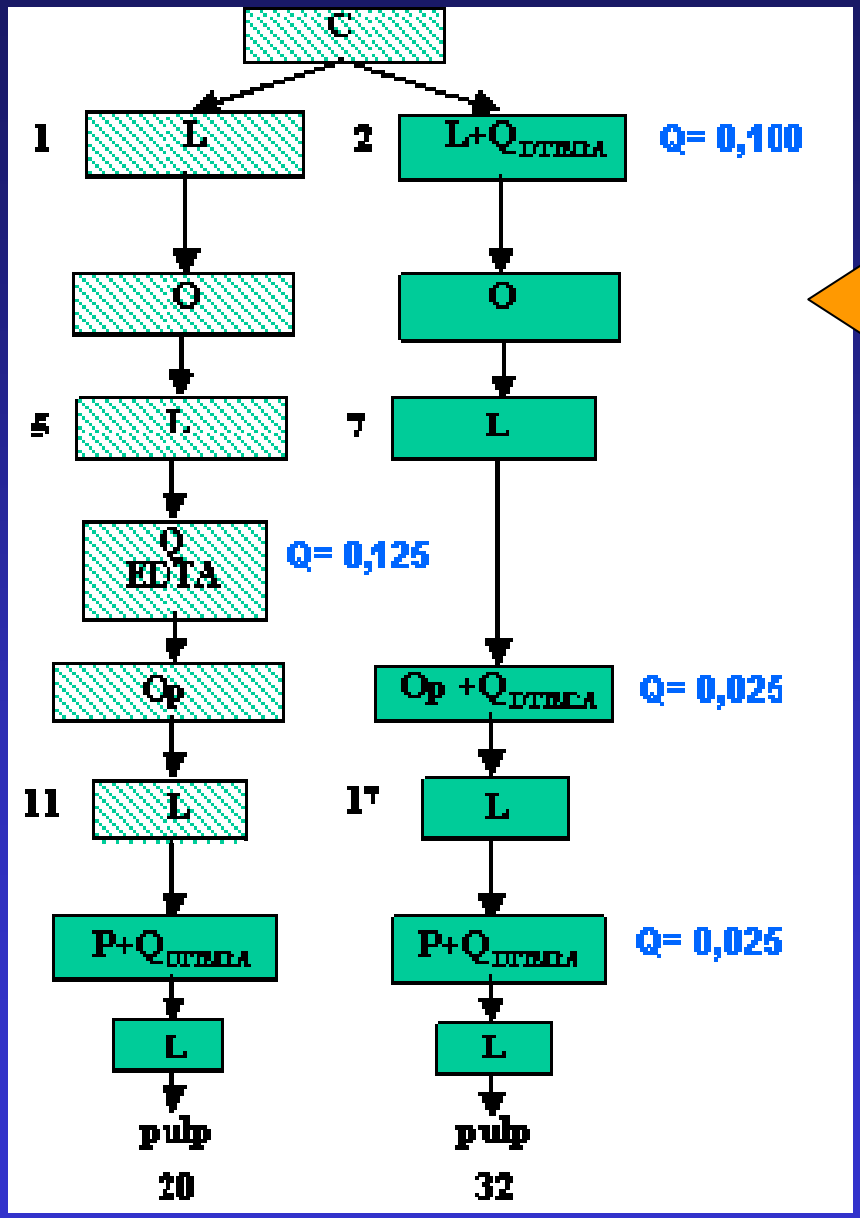
- **Treatment with DTPMPA reduced significantly all metallic ions in both pulps.**
- **Calcium values are noticeably high in industrial pulps (near 1000 ppm).**

RESULTS:
UNBLEACHED KRAFT PULPS



- **Industrial UBK pulp treated with DTPMPA show slightly better mechanical properties.**

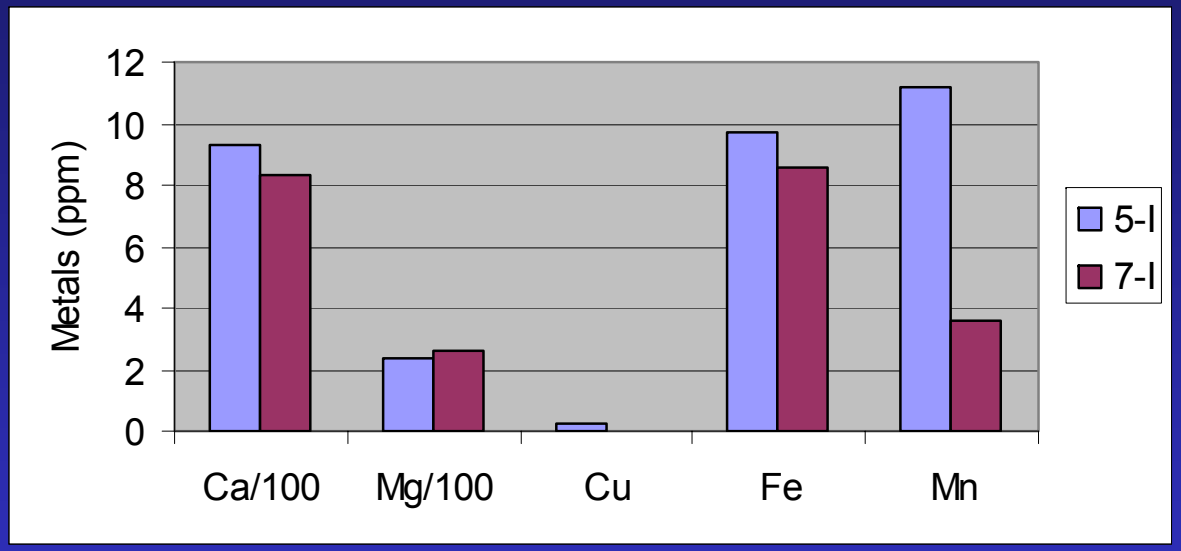
RESULTS: O STAGE



RESULTS:
O STAGE

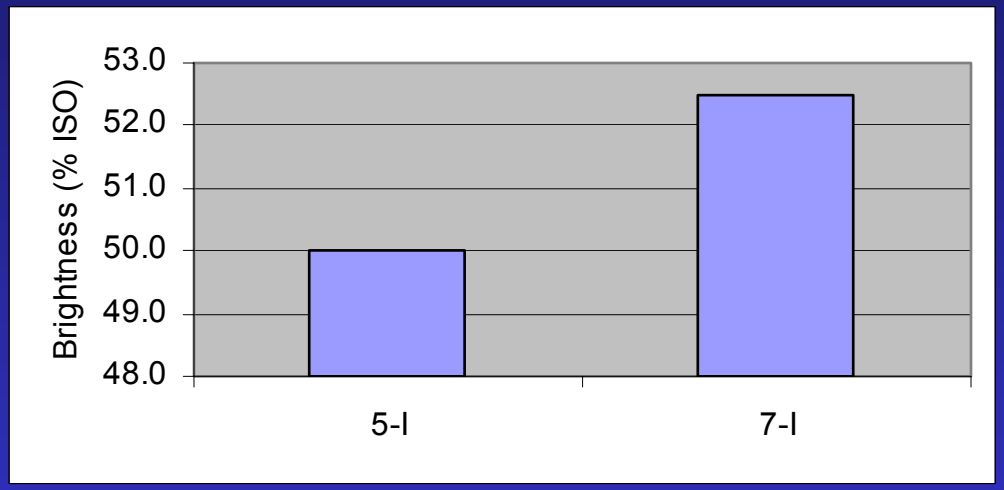
- There not exist significant differences between pulps after the O stage (pulps 5 and 7), in:
  - Kappa number
  - Viscosity
  - All physical and mechanical properties

RESULTS:
O STAGE



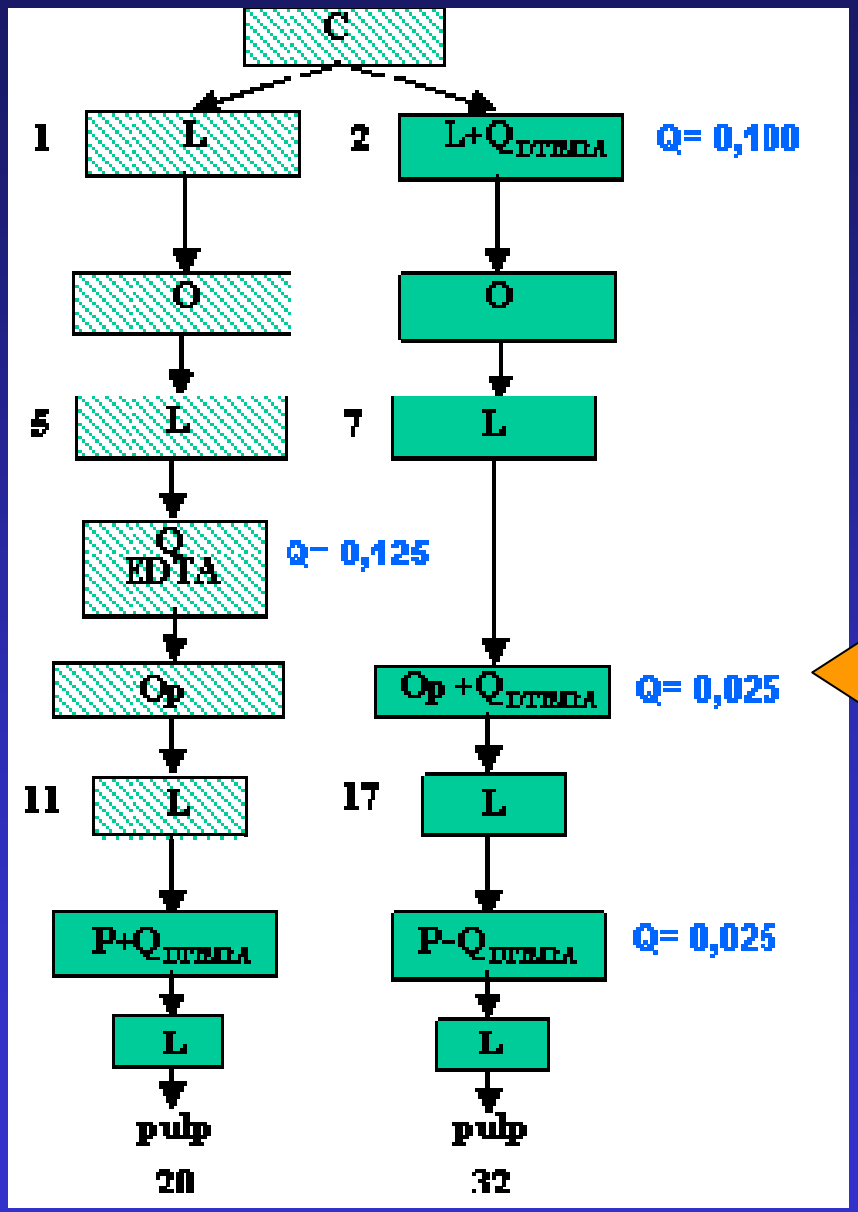
- **Brown stock washed with DTPMPA began with low Mn content (6,47 vs. 19,70 ppm):**
  - **Mn reduction L-O, pulp 5-I: 43% (only by washing).**
  - **Mn reduction L-O, pulp 7-I: 60% (chelant effect in bsw)**

RESULTS:
O STAGE

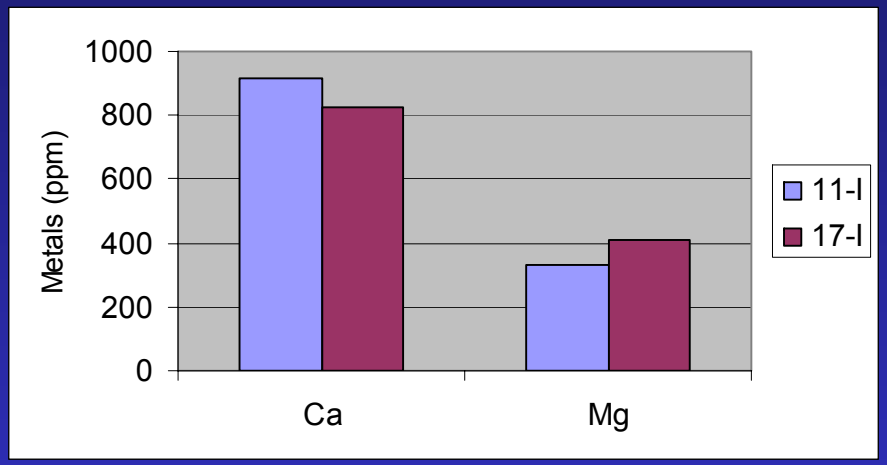


- **Pulp previously washed with DTPMPA had a brightness gain of 2.5 % ISO after the O stage compared with pulp without treatment.**

RESULTS: Op STAGE



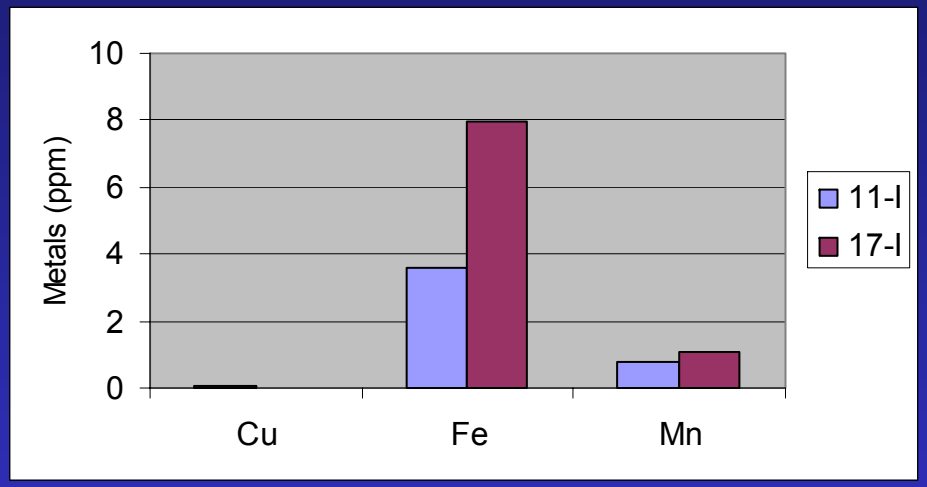
RESULTS:
Op STAGE



Without a separate Q stage

- **Mg (as $MgSO_4$) was incorporated in O and Op stages to protect viscosity.**
- **Pulps treated with DTPMPA show better Mg retention in the Op stage.**

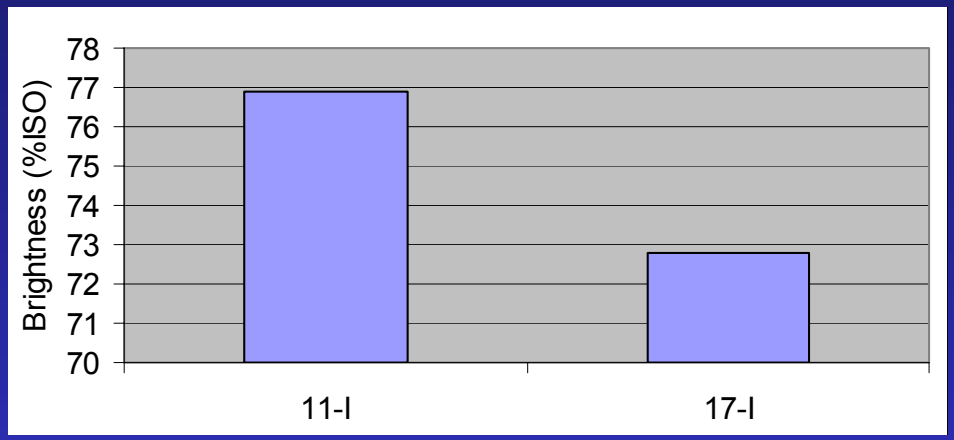
RESULTS:
Op STAGE



Without a separate Q stage

- **Mn levels at the end of the Op stage in both pulps were near 1ppm**
  - **Acceptable to enter the P stage**
- **Sequence 17 show high level of Fe.**

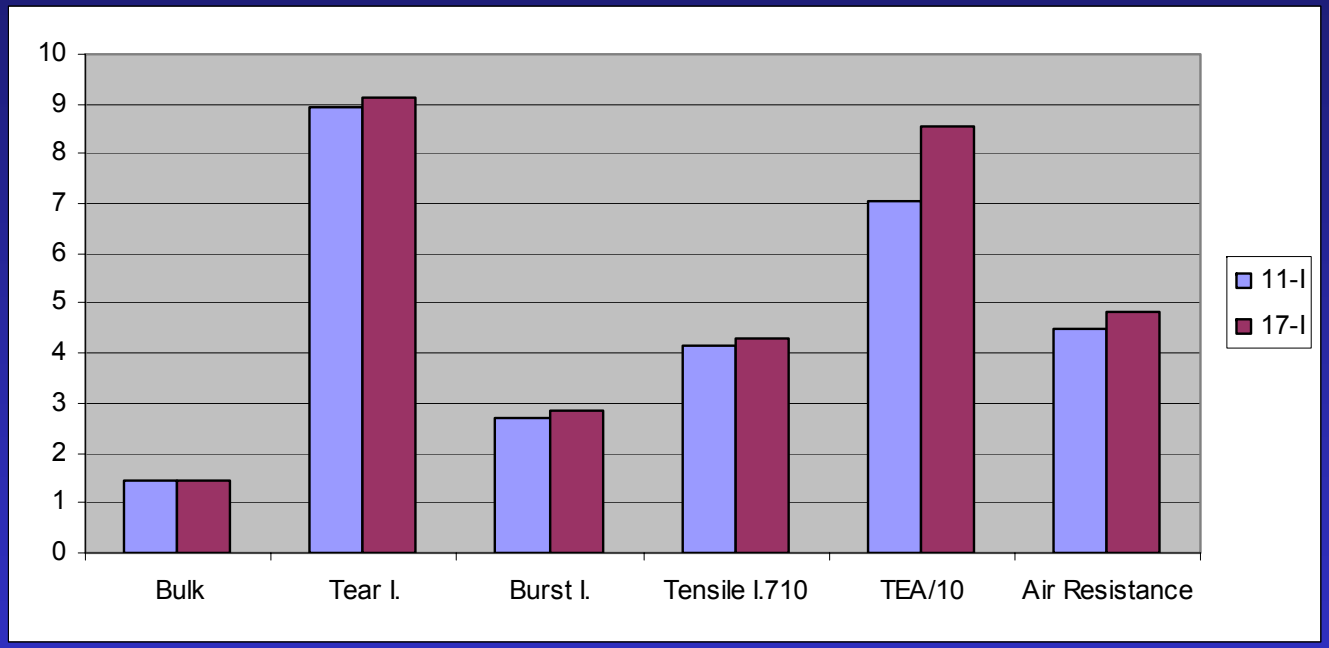
RESULTS: Op STAGE



- **Q stage:**
  - **Chelates metallic ions**
  - **Provides an additional washing**
- **Pulp I-17:**
  - **Peroxide in the Op stage was completely consumed**
  - **Selectivity and brightness decreased**

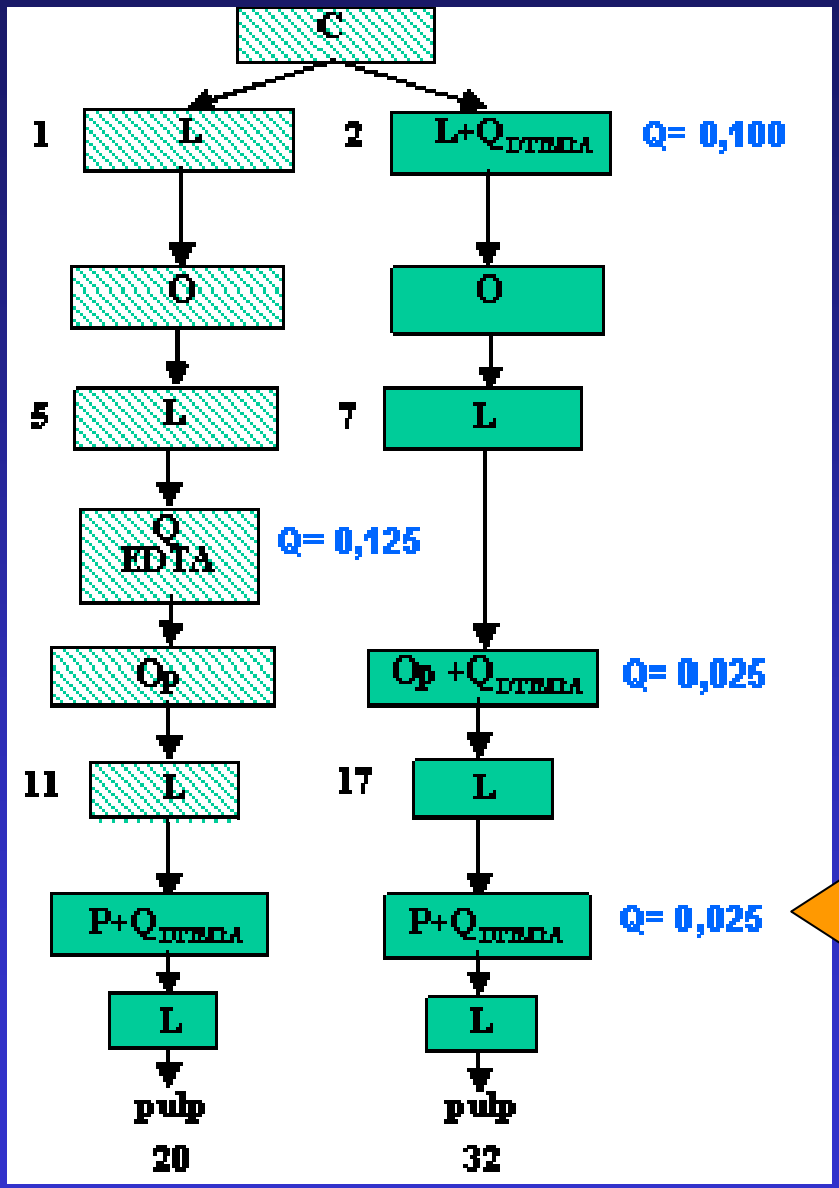
Without a separate Q stage

RESULTS:
Op STAGE

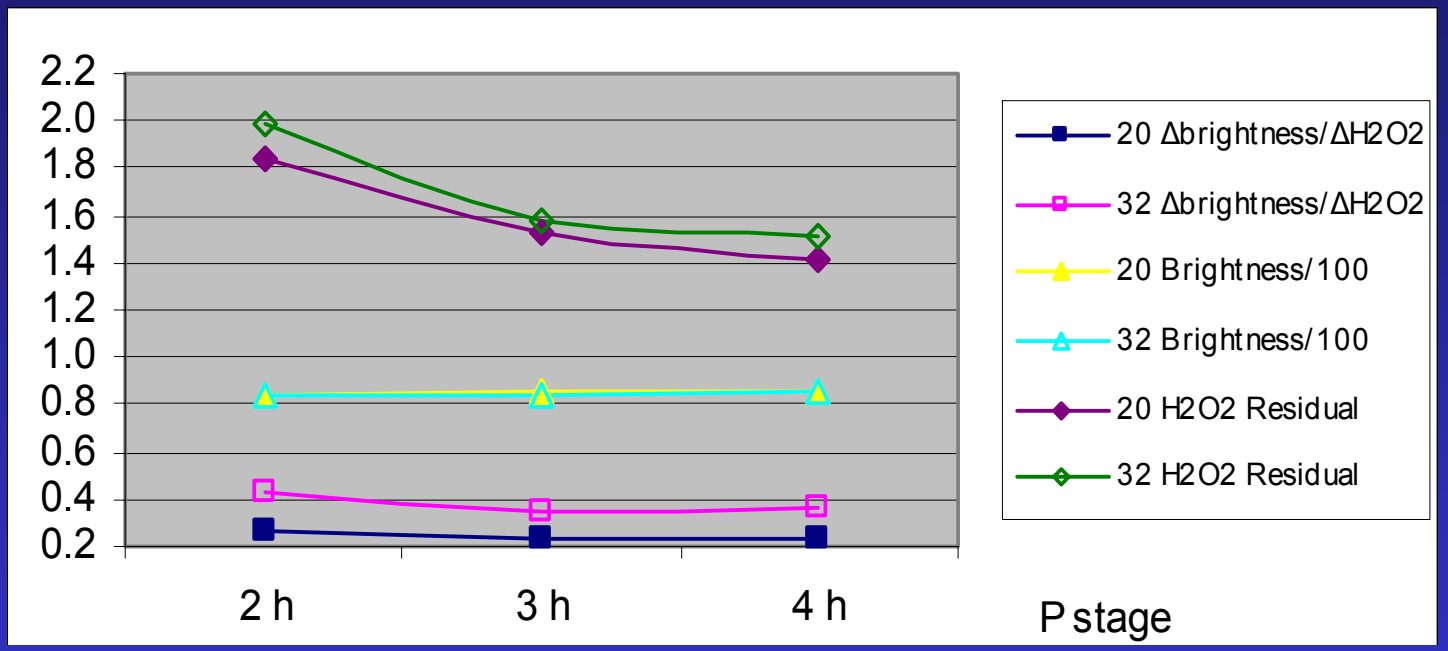


- **Pulp previously washed with DTPMPA (I-17) show slightly better mechanical properties.**

RESULTS: P STAGE

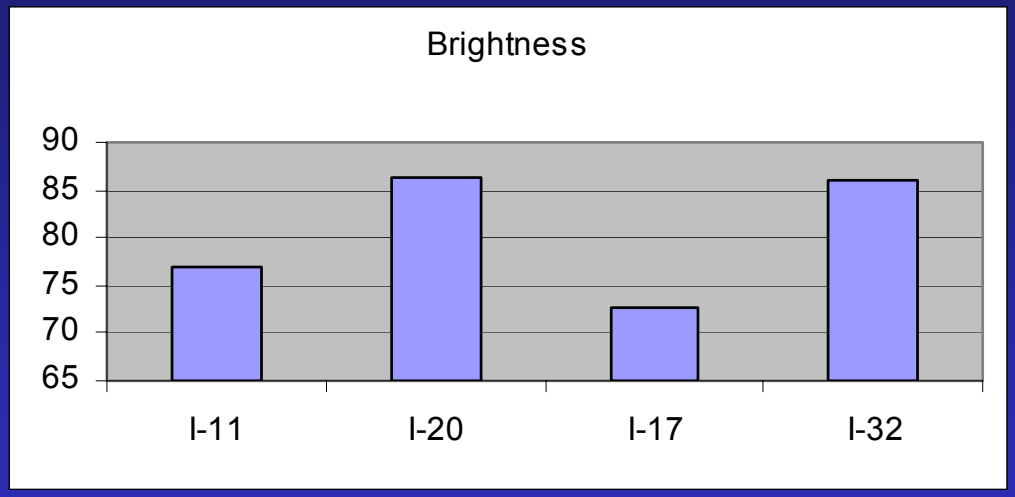


RESULTS P STAGE: BLEACHING



- **Final brightness is obtained after 4h of treatment**
- **Differences in bleaching efficiency at 2, 3, 4 h**
  - **Dues to peroxide consumption**

RESULTS P STAGE: BLEACHING

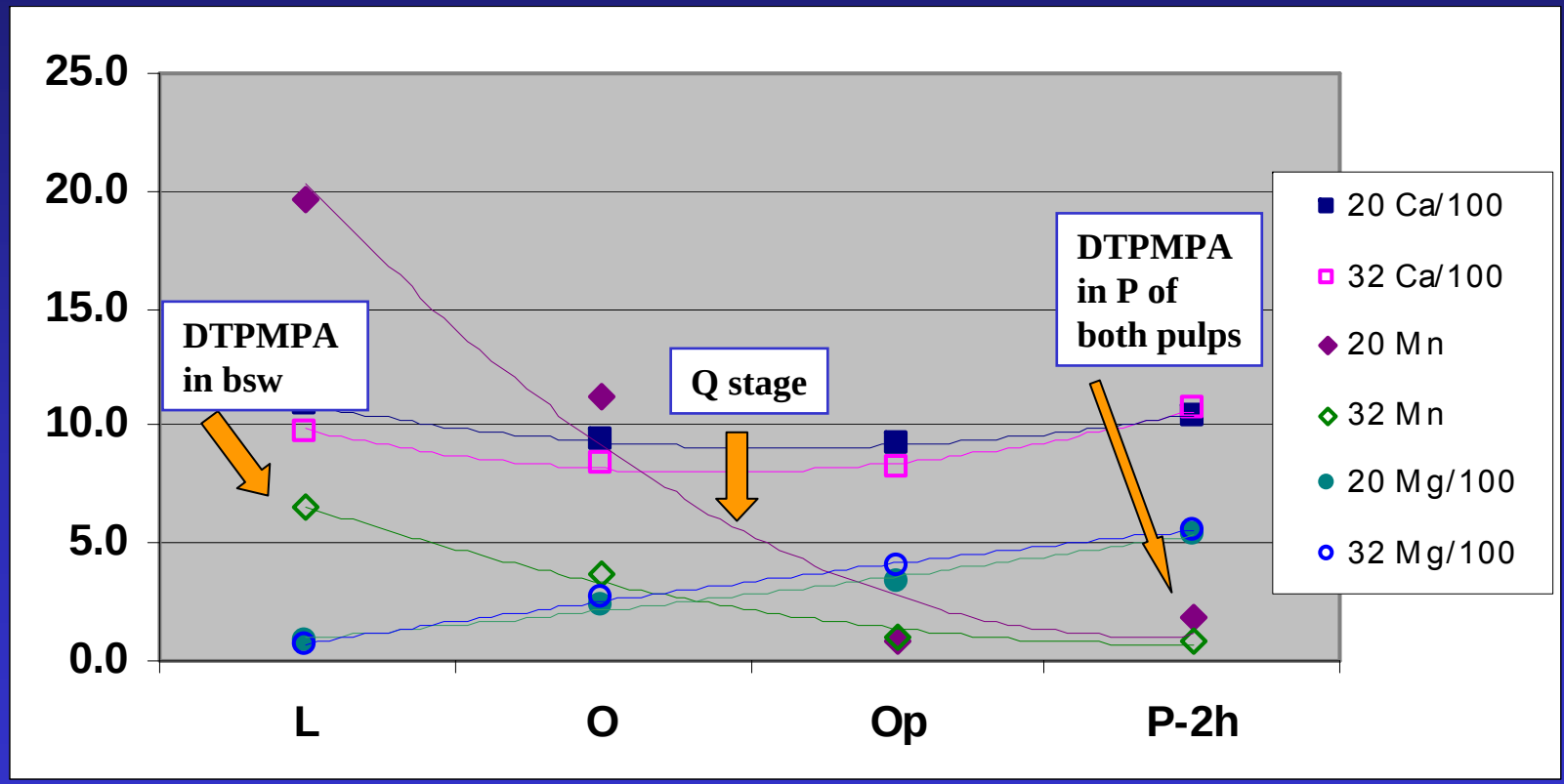


- **Similar final brightness: 86.3 vs. 85.9 %ISO**
- **Bleaching efficiency: I-32 (36%) and I-20 (23%)**
  - **56% more in pulp 32 than in pulp 20 (highest brightness gain).**

RESULTS P STAGE: BLEACHING

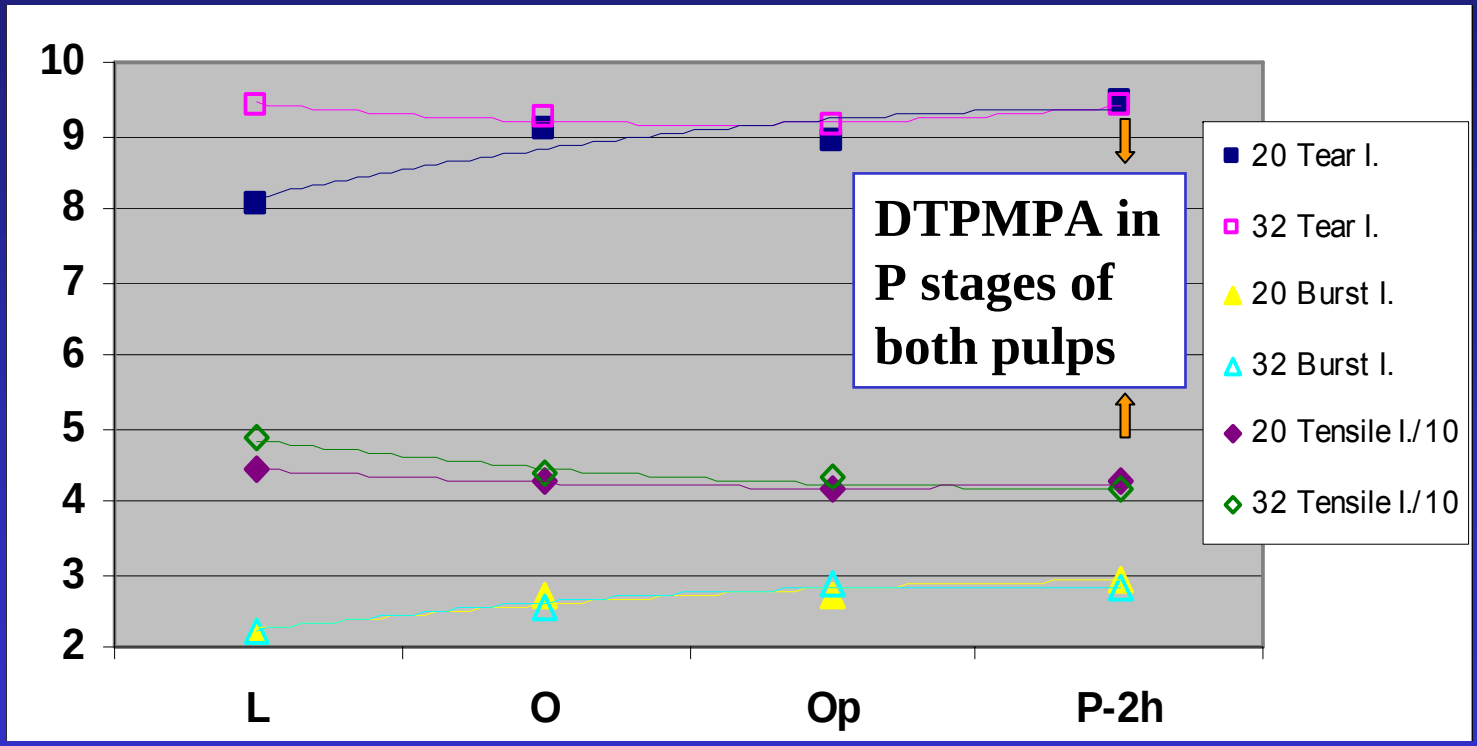
- **Residuals are sufficient to be recycled to the Op stage:**
  - **Peroxide residual superior to 1% odp**
  - **Free DTPMPA and Mg could also be recovered**
  - **Low harmful metallic ions in P spent liquors**
- **An Op-P closed loop is possible without detrimental effects.**

RESULTS:
METALS EVOLUTION



Treatment with DTPMPA in bsw, Op and P reduced significantly all metallic ions (but Mg, added in O stages).

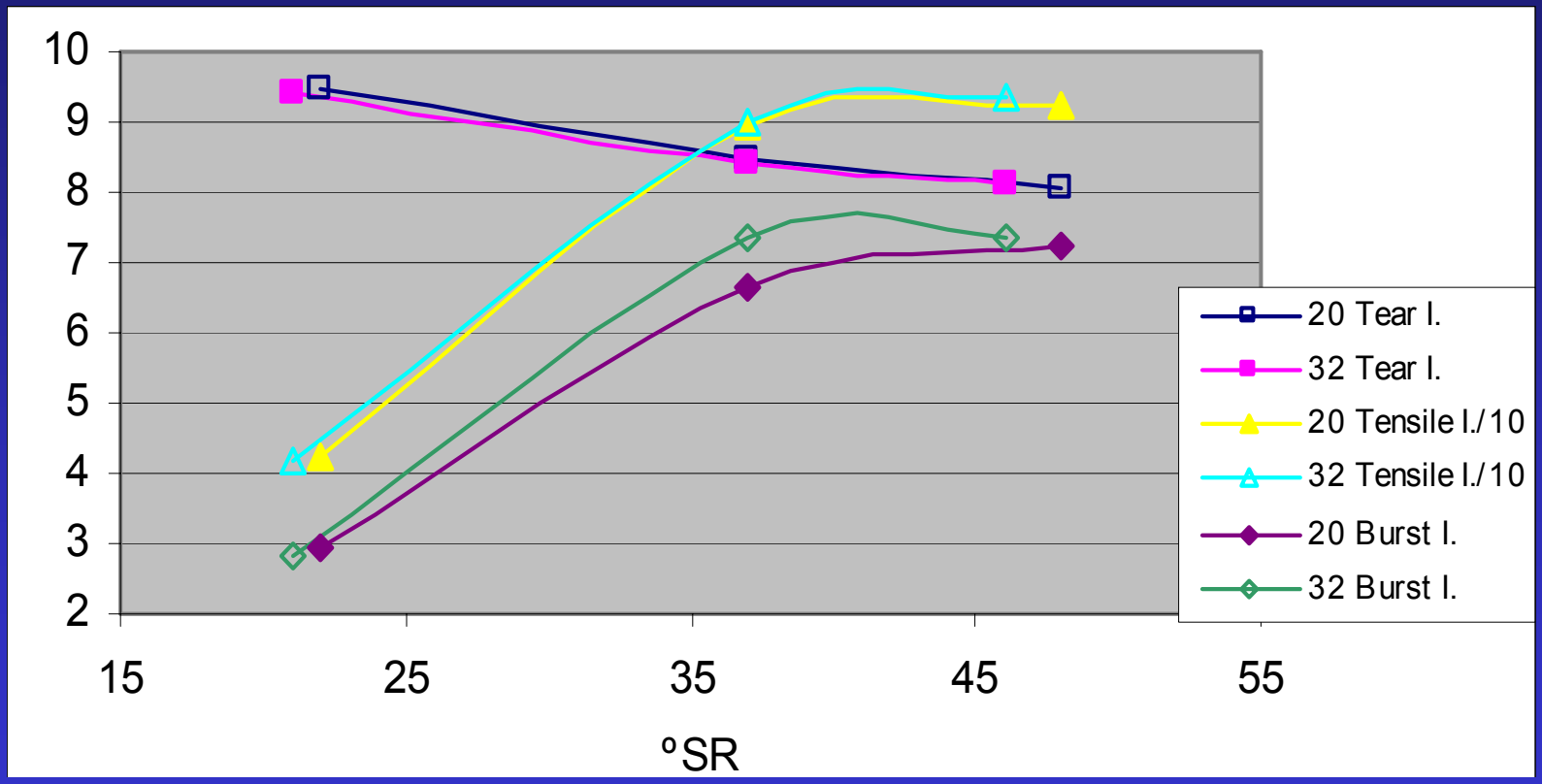
RESULTS:
PROPERTIES EVOLUTION



Similar final properties in both pulps

- Even if properties of pulp 20 were poorer in previous stages

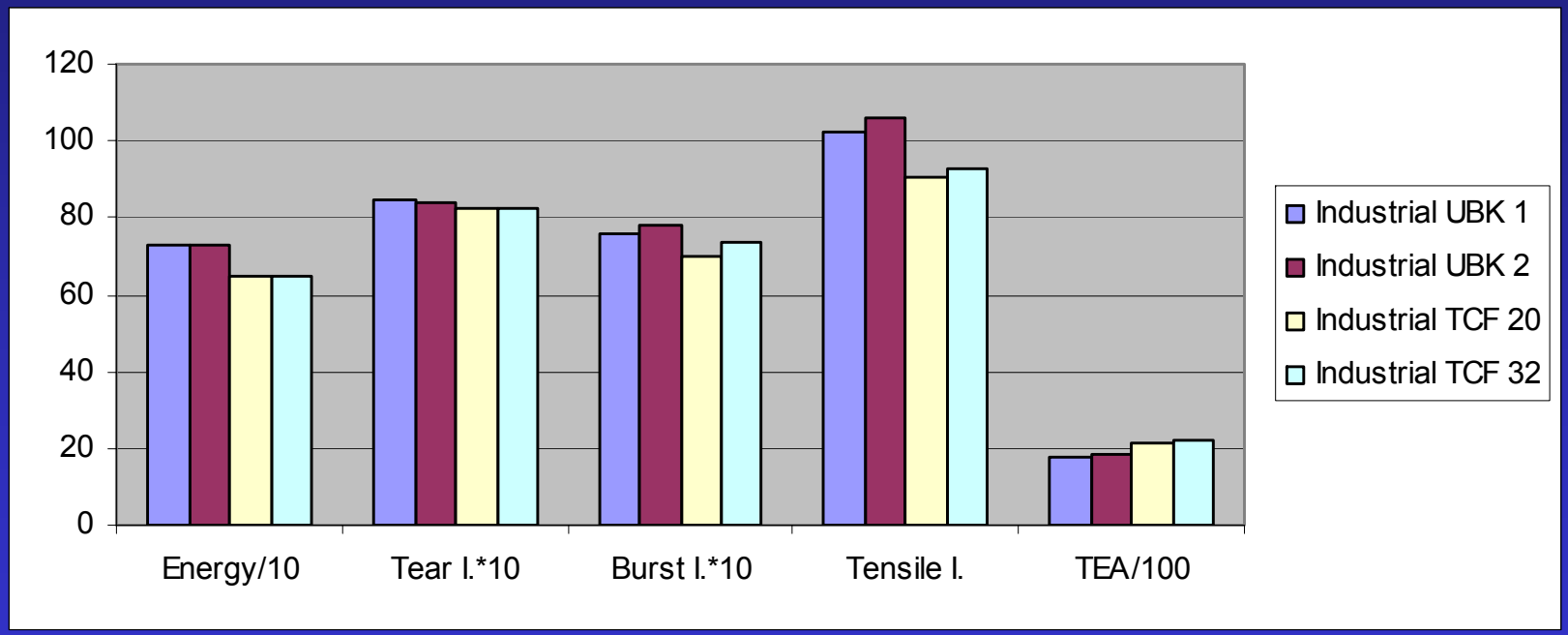
RESULTS P STAGE: MECHANICAL PROPERTIES



Evolution with refining is also comparable.

- Similar hemicelluloses quantity in both pulps.

RESULTS:
UNBLEACHED AND TCF BLEACHED REFINED TO 42-43 ºSR



Differences in refined pulps properties of UBK treated with DTPMPA are maintained after bleaching.

RESULTS: INDUSTRIAL PULPS

- UBK and P stage Industrial pulps:
  - Ca values are noticeably high (1000 ppm).
  - Ca levels decreases only 10% in all treatments (low effect of chelanting action).
  - Mechanical properties do not show differences between treated and untreated pulps.
  - All carboxylic groups are engaged with Ca^{+2}

CONCLUSIONS

- **Optical and mechanical properties of final pulps treated with DTPMPA in the P stage show no significant differences when using both sequences.**
  - **Final pulp properties were independent of previous stages properties.**

CONCLUSIONS

- It is possible to eliminate the Q stage replacing it by DTPMPA incorporation in brown stock washing, Op and P stages, obtaining similar results.
- Final brightness of 86% ISO and good mechanical properties may be obtained using a simple TCF sequence (O, Op, P), friendly to the environment.

ACKNOWLEDGEMENTS

- Solutia Inc. (in particular to Qca. Ind. Isabel C. Silva for her support).
- Dr. Jacques L. Valade (University of Quebec) and Dr. Alberto Venica for reviewing the manuscript.
- Celulosa Argentina, Capitán Bermúdez.