
DEDINI
INDÚSTRIAS DE BASE


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INTERNATIONAL WORKSHOP ON BIOENERGY POLICIES, TECHNOLOGIES AND FINANCING

9th LAMNET Project Workshop

Ribeirão Preto, São Paulo, Brazil, 13-17 September 2004

DEDINI`S DHR TECHNOLOGY

A BREAKTHROUGH IN CANE BASED ETHANOL

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OPERATIONAL VICE PRESIDENT

DEDINI S/A INDÚSTRIAS DE BASE

PRESENTATION DEDINI S/A INDÚSTRIAS DE BASE

FOUNDED IN 1920, IN BRAZIL, DEDINI BASICALLY ACTS IN THE CUSTOM-MADE CAPITAL GOODS SECTOR

PARTS, COMPONENTS, EQUIPMENT, COMPLET PLANTS (TURN-KEY), SERVICES

DEDINI INDÚSTRIAS DE BASE IS A COMPANY ORIGINATED FROM THE MERGER OF DEDINI METALÚRGICA, ZANINI AND CODISTIL DEDINI.

DEDINI'S CONTRIBUTION TO SUGARCANE INDUSTRY

OWN TECHNOLOGY	COMPLETE TECHNOLOGY	OWN DEVELOPMENT	PIONEERING

- **DEDINI TECHNOLOGIES**
  - EQUIPMENT TECHNOLOGY
  - PROCESS TECHNOLOGY
  - COMPLETE UNITS TECHNOLOGY
  - RESEARCH AND TECHNOLOGICAL DEVELOPMENT

- **DEDINI'S SUPPLIES**
  - PARTS AND COMPONENTS
  - EQUIPMENT
  - COMPLETE LINE OF PRODUCTS
  - COMPLETE PLANTS (TURN-KEY)
  - SERVICES

HISTORICAL MARKET SHARE IN BRAZIL: OVER 80%

OVER 80% OF THE ALCOHOL PRODUCED IN BRAZIL USES DEDINI'S DISTILLERIES AND EQUIPMENT.

DEDINI'S CONTRIBUTION TO SUGARCANE INDUSTRY

DEDINI'S NUMBERS – SUGAR AND ALCOHOL

- **TURNKEY PLANTS INSTALLED IN BRAZIL:**

  - **ALCOHOL DISTILLERIES** **734**

  - **ALCOHOL MILLS - AUTONOMOUS ALCOHOL PLANTS** **106**

- **ALCOHOL / SUGAR PLANTS ABROAD:**
  VENEZUELA / EQUADOR / PERU / HAITI / PAKISTAN ETHIOPIA / COSTA RICA / PARAGUAY / BOLIVIA / GUATEMALA / ARGENTINA / MEXICO **23**

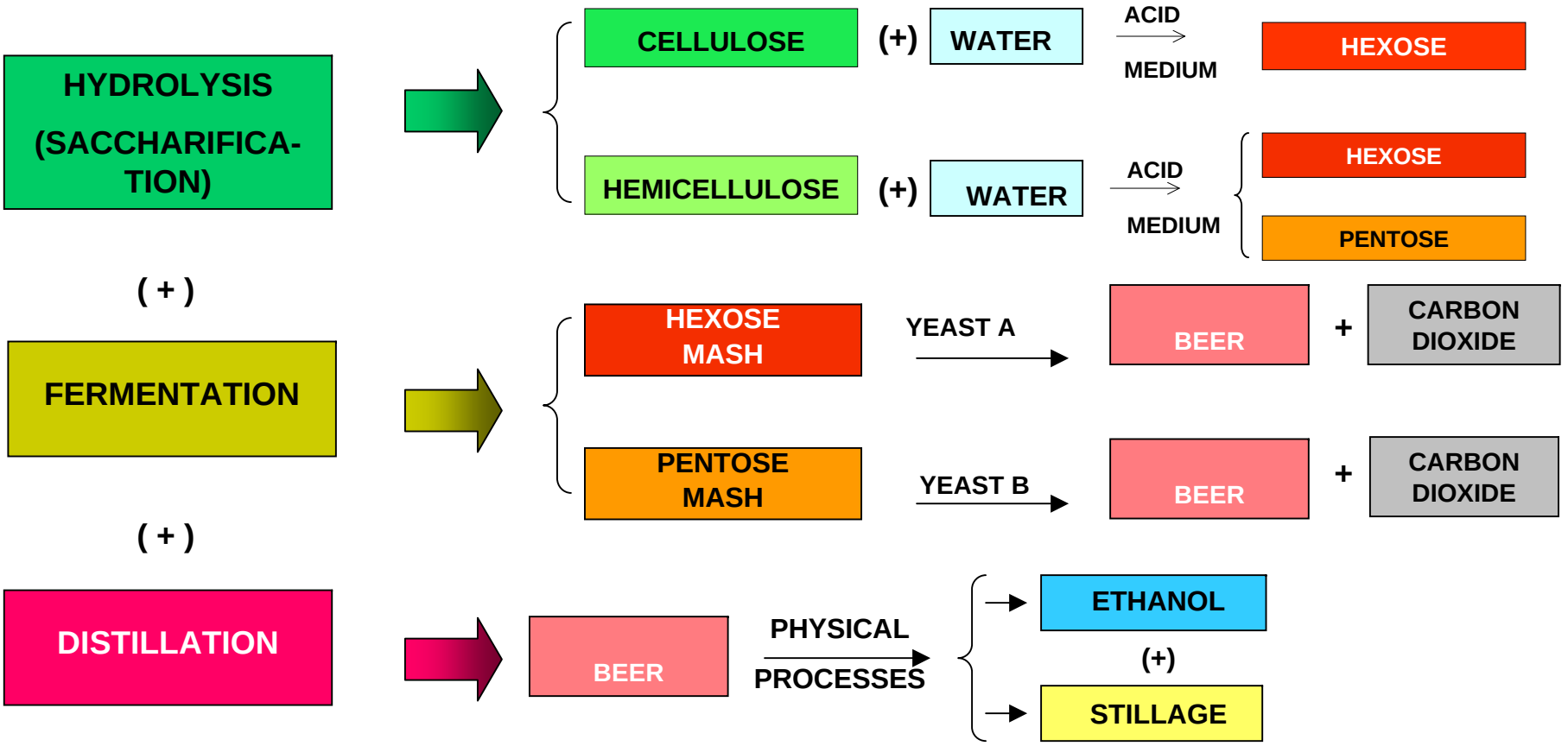
• MILLING UNITS	2.370
• BOILERS	1.200
• COGENERATION PLANTS (TK)	112

WORLD'S GREATEST SALES VOLUME

DEC/2003

INTRODUCTION TO THE HYDROLYSIS PROCESSES

THE THREE STAGES OF THE PROCESS OF ALCOHOL PRODUCTION FROM CELLULOSIC MATERIALS



INTRODUCTION TO THE HYDROLYSIS PROCESSES

HYDROLYSIS MAY BE APPLIED TO ANY CELLULOSIC MATERIAL: FORESTRY RESIDUES, WOOD, GRASSES, AGRICULTURAL RESIDUES, THAT ARE THE RAW MATERIALS FOR HYDROLYSIS.

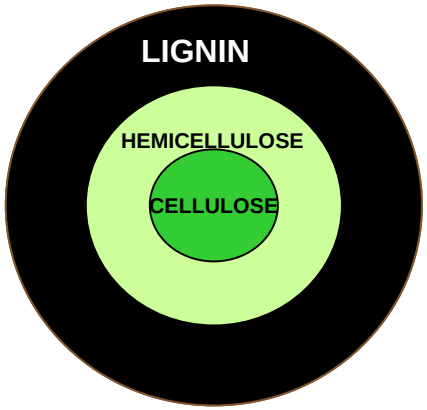
NECESSARY CONDITION FOR THE RAW MATERIAL	**AVAILABILITY**
	LOW COST/PRICE

IN BRAZIL, THE MOST SUITABLE RAW MATERIAL IS SUGARCANE BAGASSE	**ALREADY PREPARED BY THE MILLS**
	AVAILABLE IN LARGE QUANTITIES
	MINIMUM COST OR ZERO COST
	AVAILABLE AT THE PLACE WHERE USED

IN THE NEAR FUTURE, CANE STRAW MAY BE RAW MATERIAL OR, BEING USED AS BOILER FUEL, RELEASE BAGASSE FOR HYDROLYSIS.

SUGARCANE BAGASSE COMPOSITION	**NATURAL POLYMERS**	**CELLULOSE**
		HEMICELLULOSE
		LIGNIN

WHAT IS THE DHR-DEDINI RAPID HYDROLYSIS PROCESS

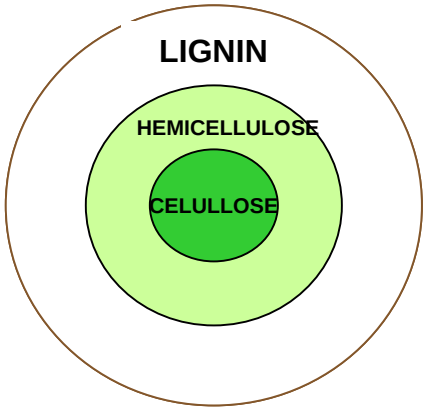


DIAGRAMATIC REPRESENTATION OF THE CUT OF A FIBER OF LIGNIN-CELLULOSIC MATERIAL

MAIN PROBLEMS OF CHEMICAL HYDROLYSIS PROCESSES

- **LIGNIN RESTRICTS ACCESS TO CELLULOSE, AND FIRST NEEDS TO BE REMOVED.**
- **THE CONDITIONS FOR REMOVING LIGNIN ARE SEVERE AND IT TAKES A LONG TIME (HOURS).**
- **THE MEDIUM IN WHICH HYDROLYSIS IS PROCESSED ATTACKS THE SUGAR FORMED. THUS, SOON AFTER THE SUGAR IS FORMED, ITS DEGRADATION IS PROCESSED, REDUCING THE YIELD OF THE REACTION.**

WHAT IS THE DHR-DEDINI RAPID HYDROLYSIS PROCESS

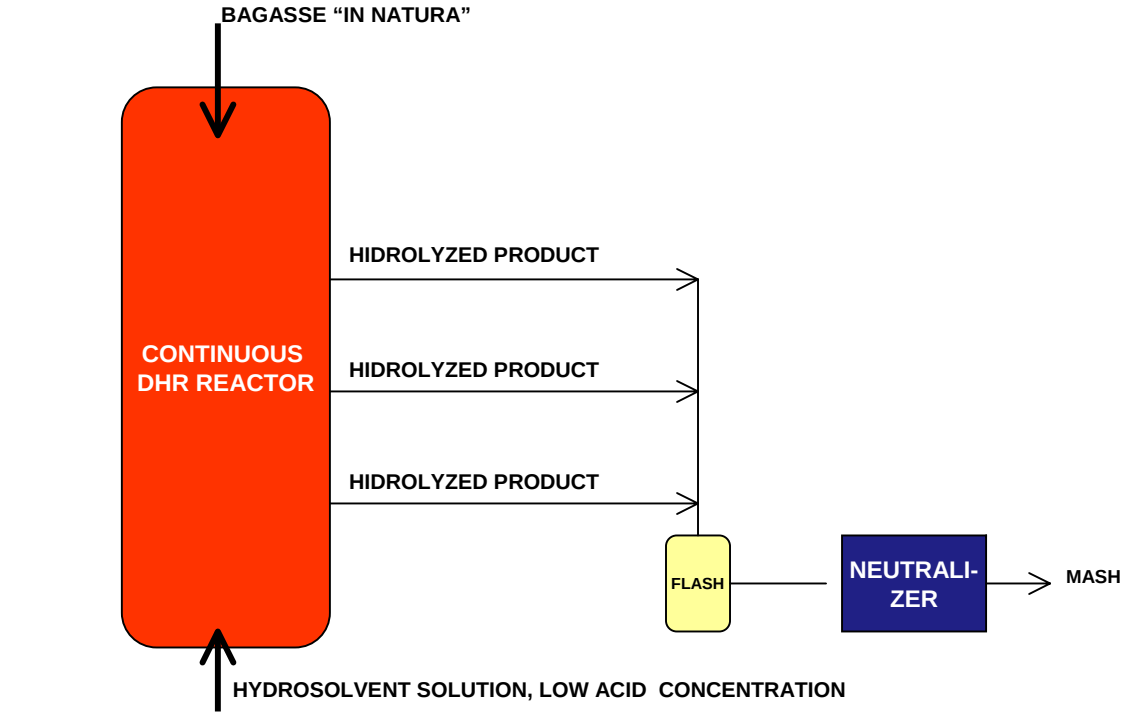


DIAGRAMATIC REPRESENTATION OF THE CUT OF A FIBER OF LIGNIN-CELLULOSIC MATERIAL

HOW DHR-DEDINI RAPID HYDROLYSIS SOLVES THESE PROBLEMS

- **USE OF A STRONG LIGNIN SOLVENT, AT HIGH TEMPERATURES, ENABLING RAPID ACCESS TO CELLULOSE AND HEMICELLULOSE, AFTER LIGNIN HAS BEEN DISSOLVED.**
- **VERY FAST SUGAR FORMATION SPEED (MINUTES), RAISING YIELDS.**
- **THE MEDIUM IN WHICH HYDROLYSIS IS PROCESSED, FAVOURED BY THE LIGNIN SOLVENT, HAS A MÍNIMUM ACID CONCENTRATION.**
- **IMMEDIATE REMOVAL OF SUGAR FORMED, WITH RAPID COOLING OF THE HYDROLYZED PRODUCT, INTERRUPTS SUGAR DEGRADATION BY THE ACTION OF TEMPERATURE.**
- **NEUTRALIZATION OF THE HYDROLYZED PRODUCT, STABILIZING THE SUGAR OBTAINED.**

WHAT IS THE DHR-DEDINI RAPID HYDROLYSIS PROCESS



DHR PROCESS	=	ORGANOSOLV PROCESS	+	CHEMICAL HYDROLYSIS WITH VERY DILUTED ACID

LIGNIN SOLVENTS - IN GREAT NUMBER (26 ANALYSED)

DEDINI USED VARIOUS SOLVENTS.
THE FINAL CHOICE WAS ETHANOL.

HISTORY OF DHR - DEDINI RAPID HYDROLYSIS PROCESS

ALCOHOL PRODUCTION FROM BAGASSE

DHR – "DEDINI HIDRÓLISE RÁPIDA" - RAPID HYDROLYSIS DEDINI: ENVOLVING HYDROLYSIS (+) FERMENTATION (+) DISTILLATION FOR THE ETHANOL PRODUCTION FROM BAGASSE.

DHR – PROCESS DEVELOPED BY DEDINI WITHIN THE 80's.
APPROVED AND FINANCED BY GOVERNMENTAL BRAZILIAN AGENCIES WITH FUNDS FROM THE WORLD BANK.

PATENTS ISSUED IN THE USA , EU, CANADA, MEXICO, BRAZIL AND RUSSIA.
PATENTS REQUESTED AND UNDER APPRECIATION IN JAPAN AND OTHER COUNTRIES.

DEDINI DEVELOPED AND OPERATED A PILOT PLANT OF 100 L ALCOHOL/DAY, CURRENTLY INSTALLED AT THE CTC-COPERSUCAR.

TECHNICAL COOPERATION AGREEMENT DEDINI - COPERSUCAR, SIGNED NOVEMBER/97.

A 5,000 L ALCOHOL/DAY SEMI-INDUSTRIAL PLANT WAS INSTALLED IN NOVEMBER/2002 AT SÃO LUIZ SUGAR AND ALCOHOL PLANT, DEDINI GROUP, LOCATED IN PIRASSUNUNGA - SP, BRAZIL. PROJECT GATHERED DEDINI, COPERSUCAR AND FAPESP (STATE OF SÃO PAULO RESEARCH SUPPORT OFICIAL AGENCY)

TODAY: SEMI INDUSTRIAL PLANT IN CONTINUOUS OPERATION STAGE, IN ORDER TO CONCLUDE THE DEFINITION OF ENGINEERING PARAMETERS THAT WILL BY UTILIZED TO DEVELOP A FULL SCALE INDUSTRIAL PLANT.

HISTORY OF DHR - DEDINI RAPID HYDROLYSIS PROCESS

DHR IS A PERSONAL PROJECT OF MR. DOVILIO OMETTO, SHAREHOLDER AND CHAIRMAN OF DEDINI, WHO BELIEVED IN DHR – DEDINI RAPID HYDROLYS PROCESS AND LEADED IT SINCE ITS BEGINNING (DECADE OF 1980)

DEVELOPMENT OF THE DHR-DEDINI RAPID HYDROLYSIS TECHNOLOGY

DHR PILOT AND LABORATORY

GENERAL VISION – DHR PILOT PLANT

PILOT 100 L ALCOHOL/DAY

BAGASSE FEEDING

DHR REACTOR

SAMPLE: BAGASSE "IN NATURA", HYDROLYZED FROM THE REACTOR, HYDROLYZED FROM THE COLUMN OF SOLVENT RECUPERATION; DHR ALCOHOL.

ALCOHOL PRODUCTIVITY L HYD ETH / TON BAGASSE " IN NATURA"	
PILOT – ACTUAL (ONLY HEXOSE)	109
DHR PROCESS POTENTIAL (HEXOSE+PENTOSE)	180

DEVELOPMENT OF THE DHR-DEDINI RAPID HYDROLYSIS TECHNOLOGY

MAIN RESULTS ACHIEVED

YIELD IN TRS – TOTAL REDUCING SUGARS

AVERAGE - RUN	-	68,2%
STABLE PEAK – STABILITY CONDITION	-	88%

TRS CONCENTRATION IN HYDROLYZED PRODUCT: 10,9%

FERMENTATION YIELD (HEXOSE): 89%

REACTOR FEED RATE: 343,7 G/MIN
(20,6 KG/H)

STABLE AND CONTINUOUS OPERATION

DEVELOPMENT OF THE DHR-DEDINI RAPID HYDROLYSIS TECHNOLOGY

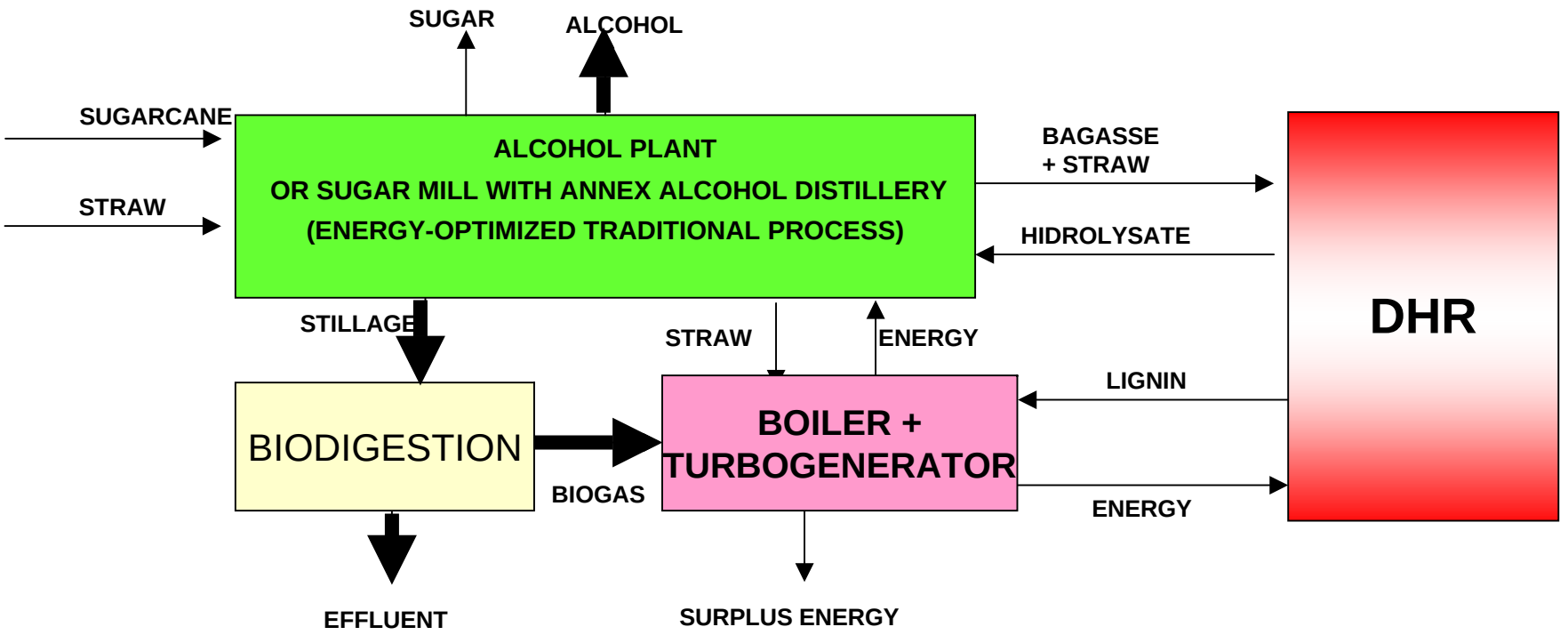
THE SEMI INDUSTRIAL PLANT - 5,000 L/DAY

BAGASSE: RAW MATERIAL FOR THE DHR
AND DHR HYDROLYSIS PLANT

REACTOR TOWER WITH BAGASSE
FEEDING SYSTEM

POTENTIAL AND IMPACT OF DHR - DEDINI RAPID HYDROLYSIS PROCESS

DHR INTEGRATION TO TRADITIONAL PLANT



POTENTIAL AND IMPACT OF DHR - DEDINI RAPID HYDROLYSIS PROCESS

DHR – ENVIRONMENTAL IMPACT

ALCOHOL-

OXYGENATING ADDITIVE OF

GASOLINE

→ **VEHICLE EMISSIONS FROM ETHANOL-GASOLINE MIXTURES ARE LESS POLLUTING**

ALCOHOL – AUTOMOBILE FUEL

→ **ETHANOL FROM BIOMASS HAS ADVANTAGES AS REGARDS VEHICLE EMISSIONS AND BECAUSE THEY DO NOT CONTRIBUTE TO THE GREENHOUSE EFFECT**

ALCOHOL - ADDITIVE

OR

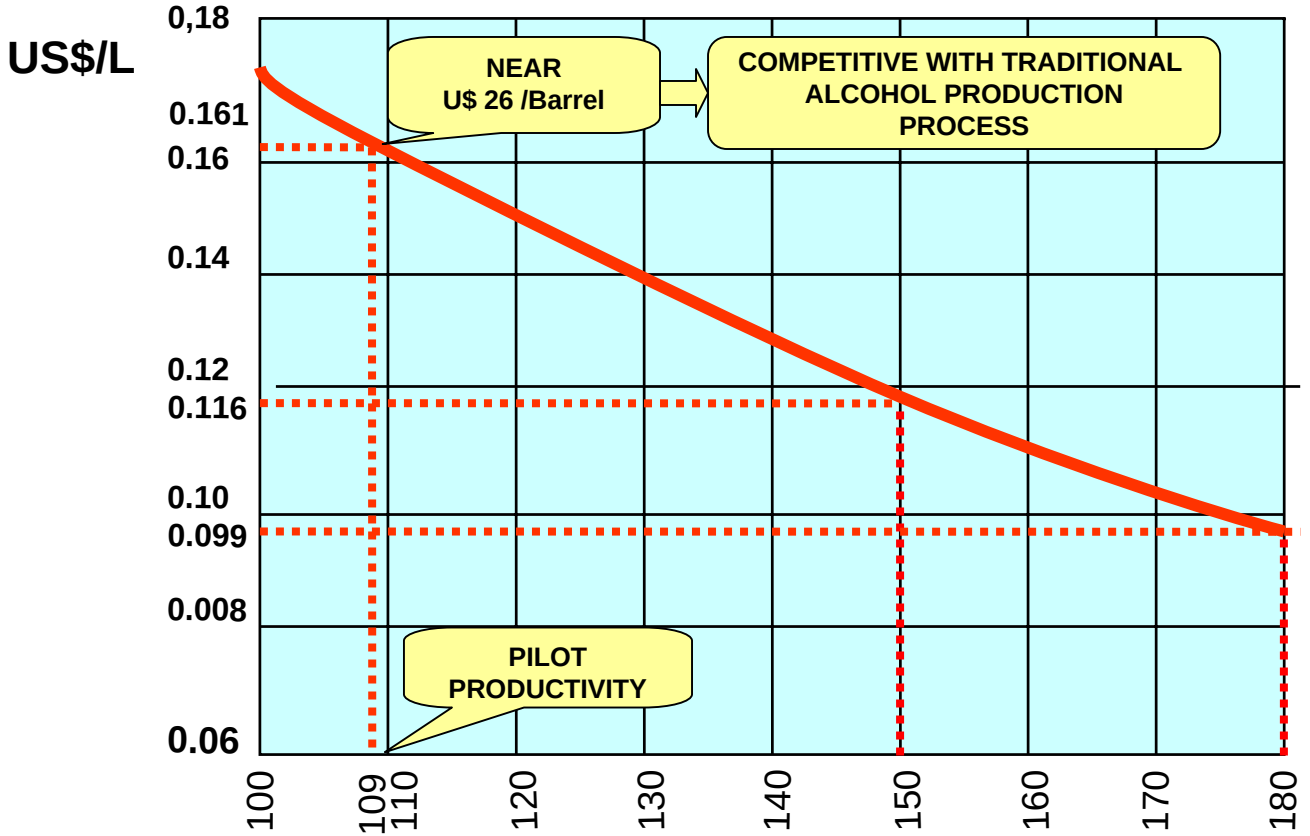
FUEL

→ **BEING A RENEWABLE SOURCE OF ENERGY AND REPLACING PETROLEUM, PROMOTES CARBON SEQUESTERING, REDUCING THE GREENHOUSE EFFECT. VALORIZING STRAW, CONTRIBUTES TO ELIMINATE CANE BURNING.**

POTENTIAL AND IMPACT OF DHR - DEDINI RAPID HYDROLYSIS PROCESS

DHR – ECONOMIC IMPACT

REDUCTION IN THE COST OF ALCOHOL WITH THE EVOLUTION OF DHR TECHNOLOGY



Conservative initial Productivity.

Acceptable for emergent technology.

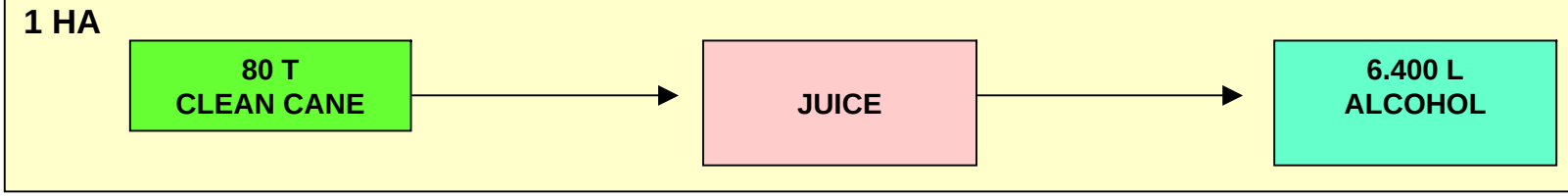
Greater productivity results from experience and development of the technology

Potential Productivity of the process

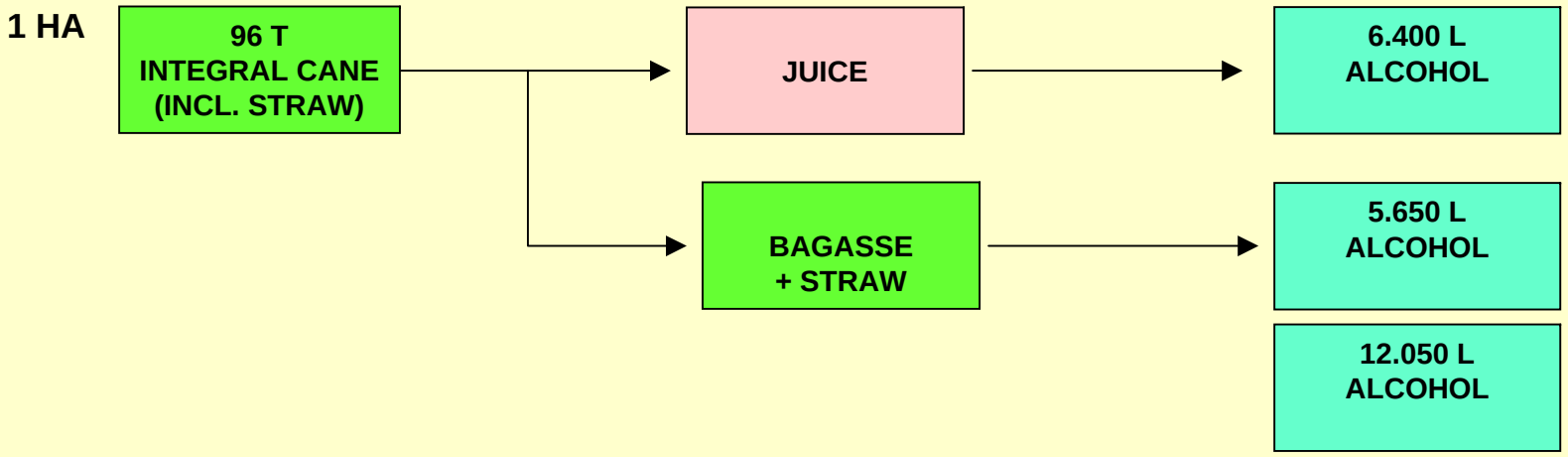
POTENTIAL AND IMPACT OF DHR - DEDINI RAPID HYDROLYSIS PROCESS

DHR – IMPACT ON PRODUCTION AND PRODUCTIVITY – CONTRIBUTION TO THE OFFER

AUTONOMOUS ALCOHOL PLANT - AVERAGE PRODUCTIVITY – BRAZIL CENTER SOUTH – TRADITIONAL ALCOHOL PROCESS - EXAMPLE



AUTONOMOUS ALCOHOL PLANT - AVERAGE PRODUCTIVITY – BRAZIL CENTER SOUTH – TRADITIONAL ALCOHOL PROCESS + DHR (PRODUCTIVITY AT THE POTENTIAL)
EXAMPLE – WITH ENERGETIC OPTIMIZATION IN THE TRADITIONAL ALCOHOL PROCESS



IT IS POSSIBLE TO ALMOST DOUBLE THE ALCOHOL PRODUCTION IN THE SAME CULTIVATED LAND AREA

THANK YOU

FOR YOUR ATTENTION

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