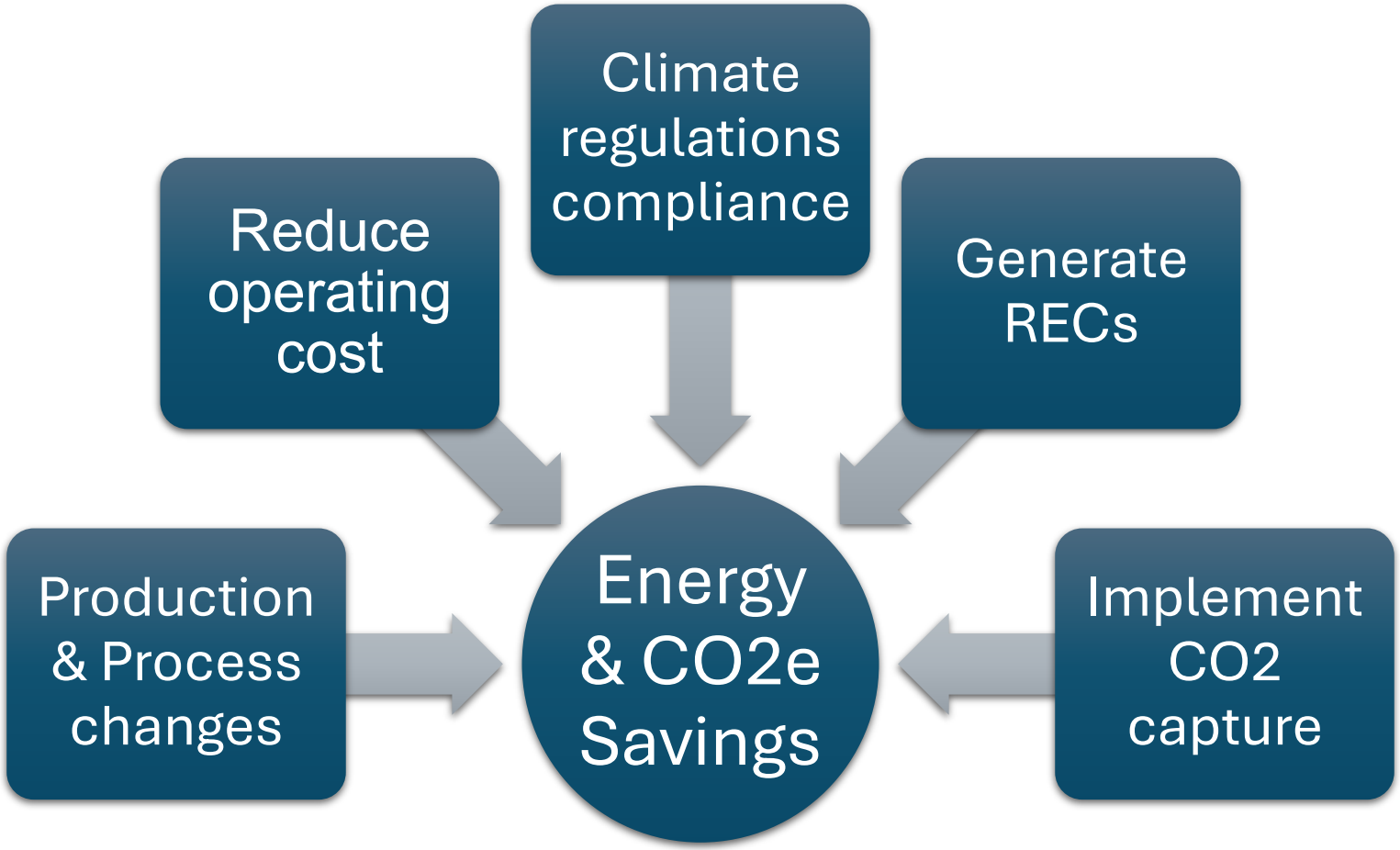
Process Integration applications for energy and carbon footprint reduction in the pulp and paper industry

Lee Hill, Chief Operations Officer
Sofia Rouzinou, Technical Director
American Process International LLC

Introduction

- **Drivers for steam & CO2 emissions savings**



How to achieve energy & CO2e savings?

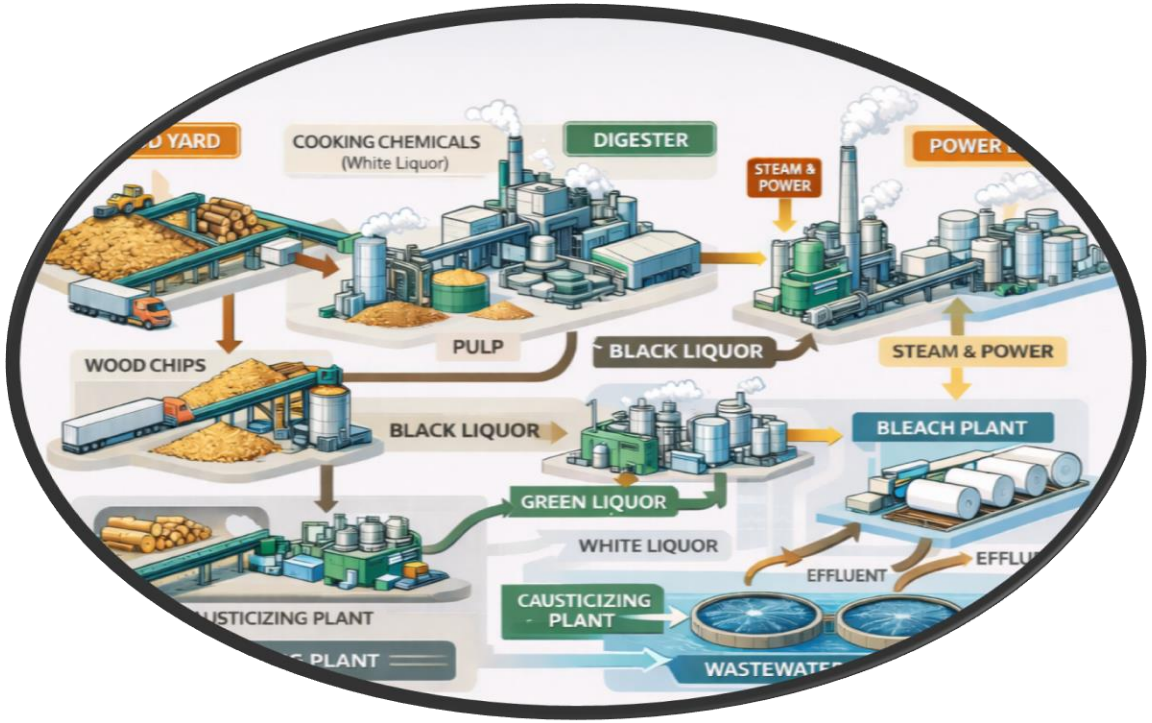
- Recover heat from the machine exhaust to heat air?
- Add a blow heat evaporator?
- Install a heat pump to upgrade flash vapor for high temperature water heating?
- Install a heat exchanger to heat demin water with evaporator vapor?
- Etc.…

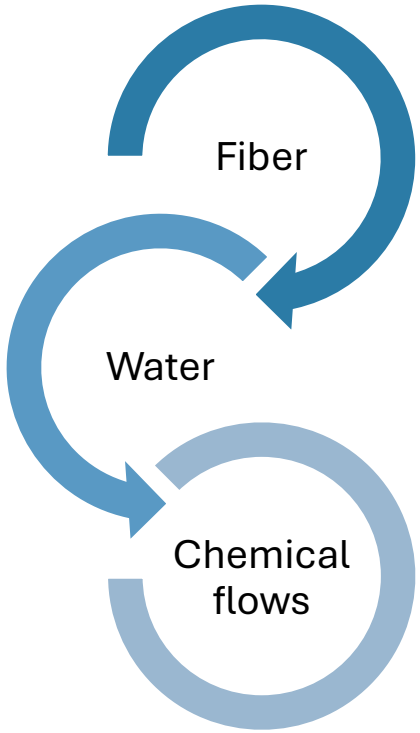
- **Several options and technologies available!**
- The critical ***question***:
  - **Which projects are the best for THIS mill?**
- **Answer:**
  - **Pinch analysis & Process Integration**

Why choose Pinch analysis?

- Pinch generates a ***mill-specific*** energy ***target*** – tailored to your process
- It does ***not benchmark*** against other similar mills or BAT values
- Defines ***the best potential performance*** for your unique mill

Analysis must be mill-wide

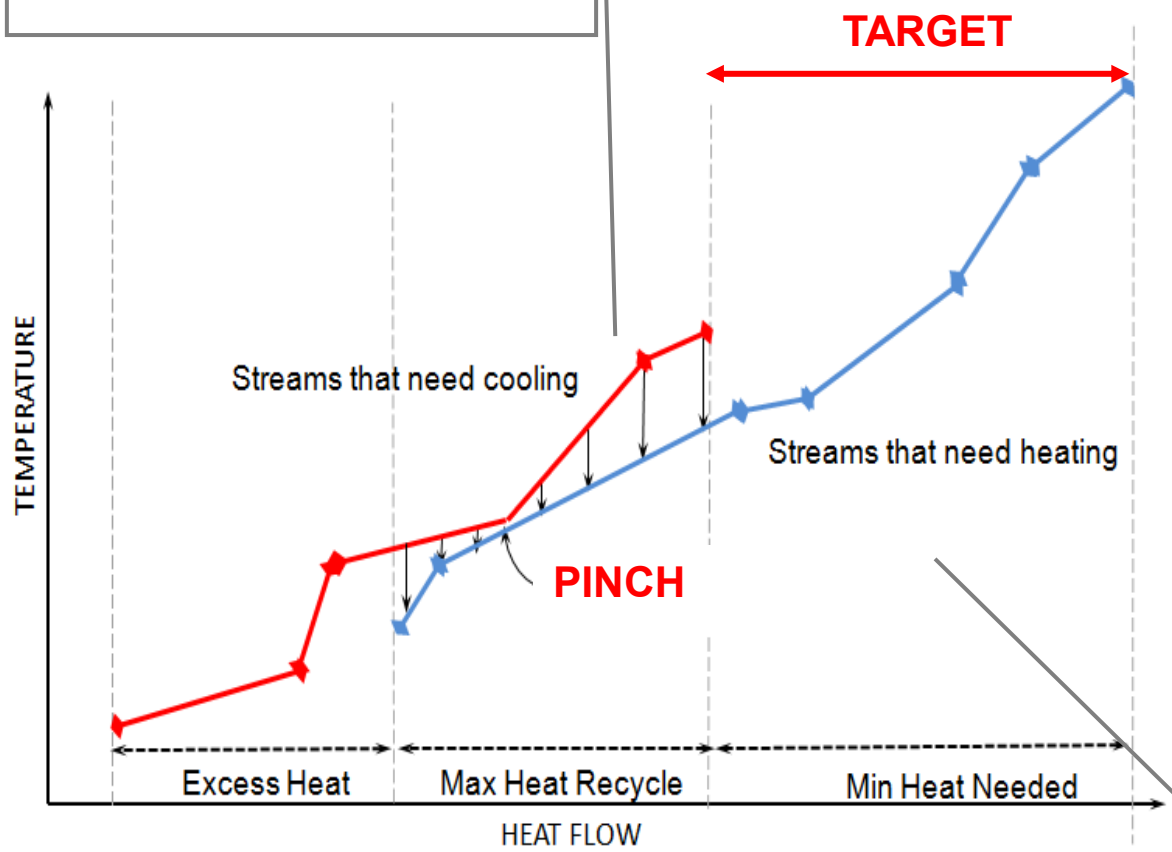




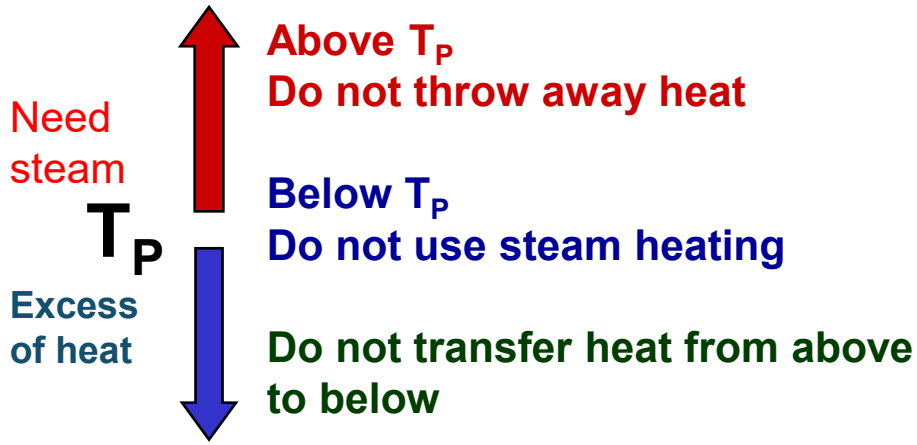
- Pinch examines the mill as a ***whole***
- All synergies explored
- No opportunity is missed

Pinch Technology Concepts

hot blow, accumulator hot water, machine exhaust etc.

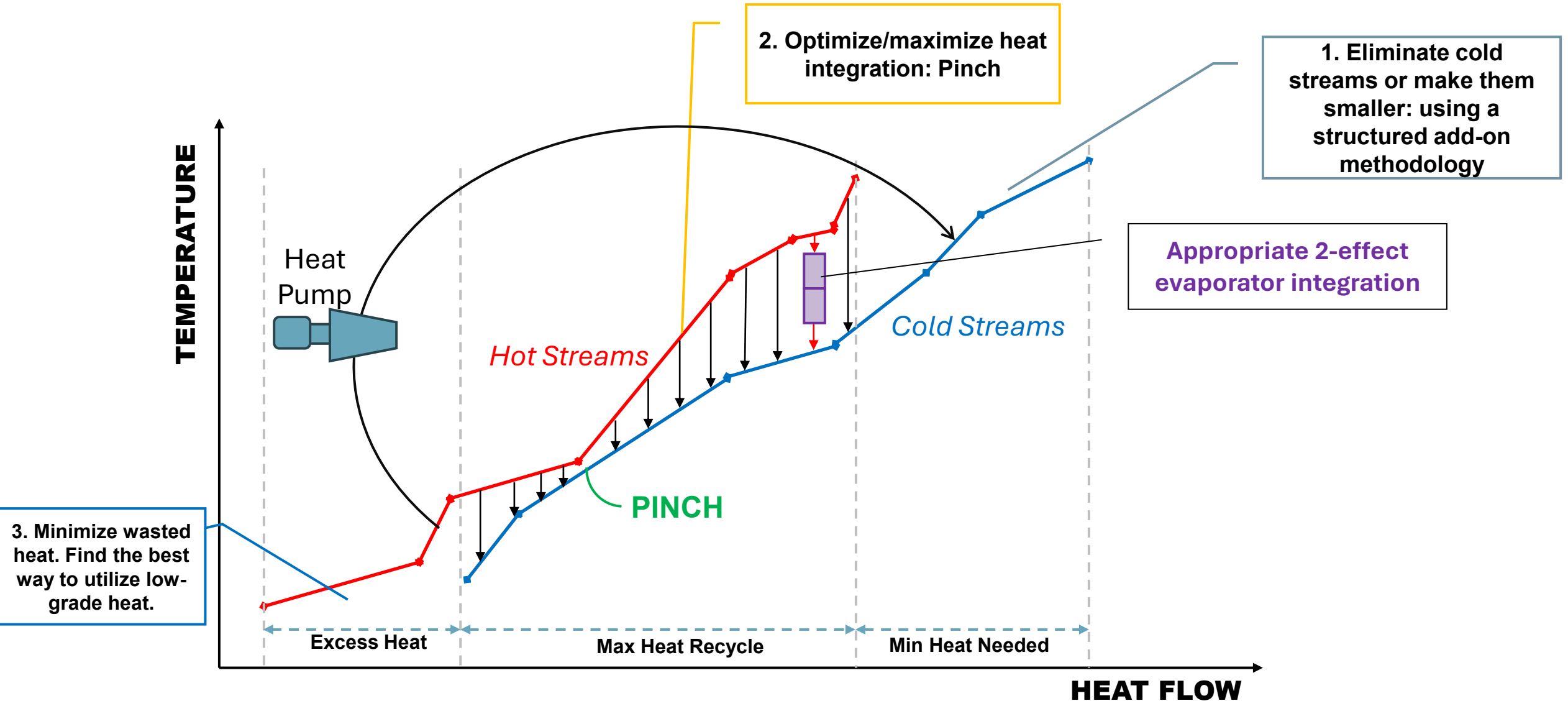


- Visualize the mill as a heat exchanger and discover where there **is excess heat** – where there is **heat needed** and
- Where is the critical temperature that defines the heat distribution **THE PINCH**.
- Then formulate project using the 3 simple rules:



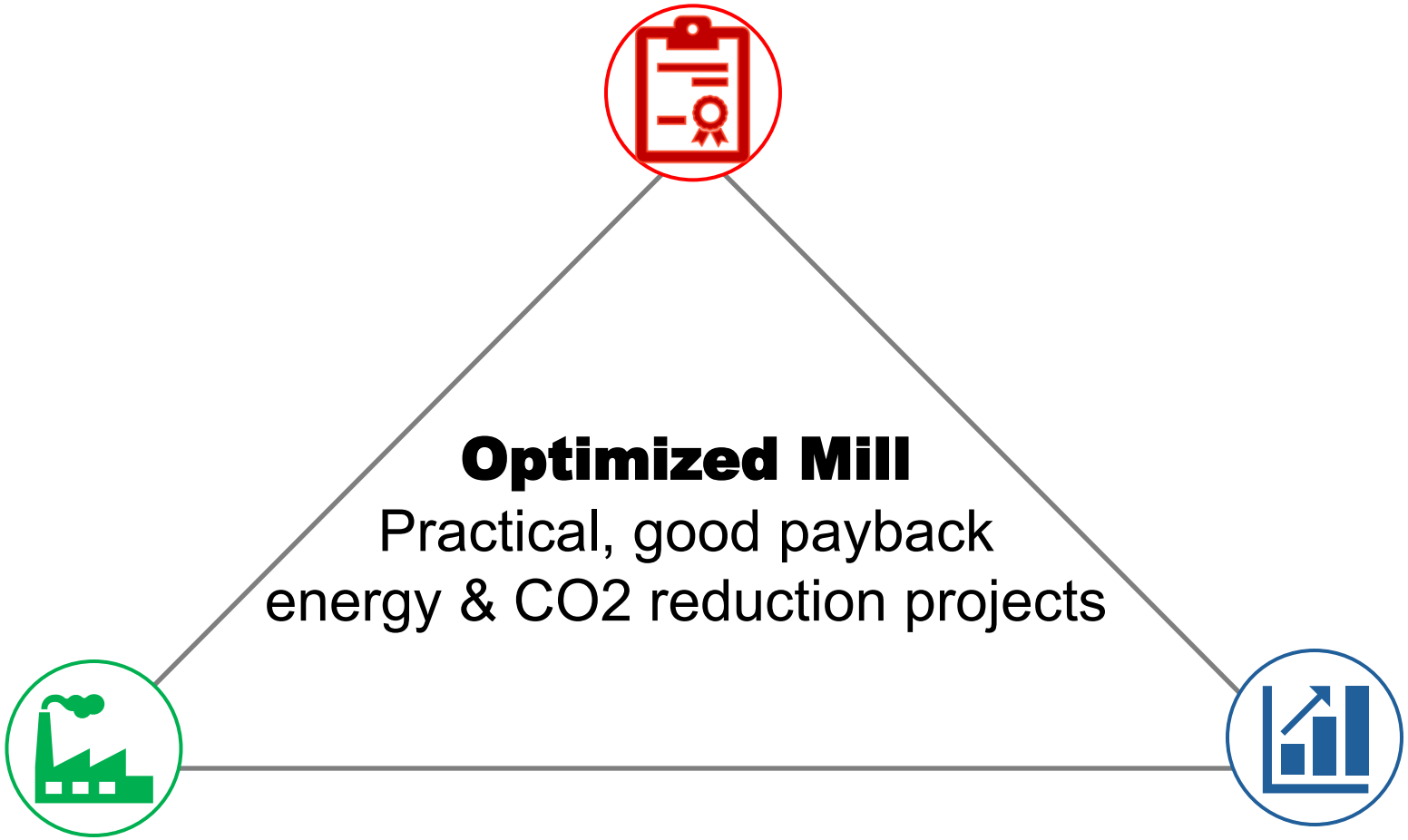
boiler feed water, white liquor heating, evaporator demand, etc.

How to work with Pinch



What does it take to do a Pinch analysis?

Proven Pinch Experience



Deep Pulp & Paper Know-How

Understanding of Economic Drivers

Results from 500 API studies over 30 years

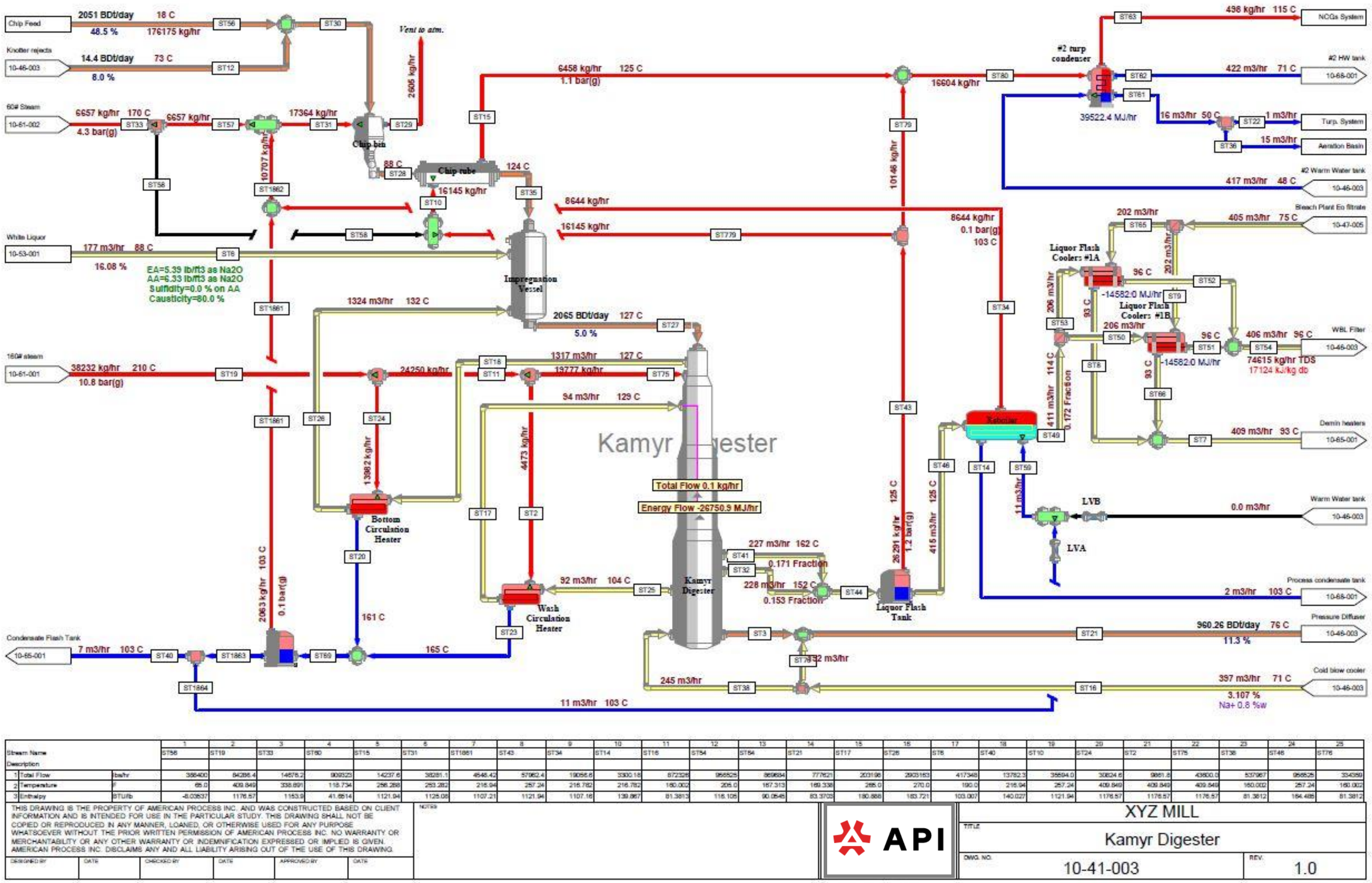
	Average steam savings	% of steam saved	Average specific steam savings	Fossil CO2 emissions reduction	Fossil CO2 emissions reduction	Project payback
Engineering Units	MMBtu/h	% of total	MMBtu/BD short ton	Metric tons per year	% of total	years
Average of all studies	104	17%	3.35	58,000*	46%	< 2

+ significant water savings

* CO2 emissions normalized based on average steam savings, 80% Natural Gas boiler efficiency and CO2e factor of Natural Gas 0.05338 MT/MMBtu

Additional essential tools for Pinch studies

Simulation Modeling



Importance of a mill-wide model

- Calculate missing data
- Identify erroneous measurements
- Create a reference point of average – normal operating conditions
- Allows evaluation of site-wide-impact of projects and changes
- Analysis of scenarios

Capital Light Improvement using Pinch (CLIP)

- Examine the **cold** streams – the streams that need energy
  - Can we eliminate them by operational projects?
  - Can we make them smaller by operational projects?
  - Consult mill personnel before including them into the analysis
- Performed before developing capital projects
  - Both capital and energy is saved

Key Tools of the methodology:

Benchmarking

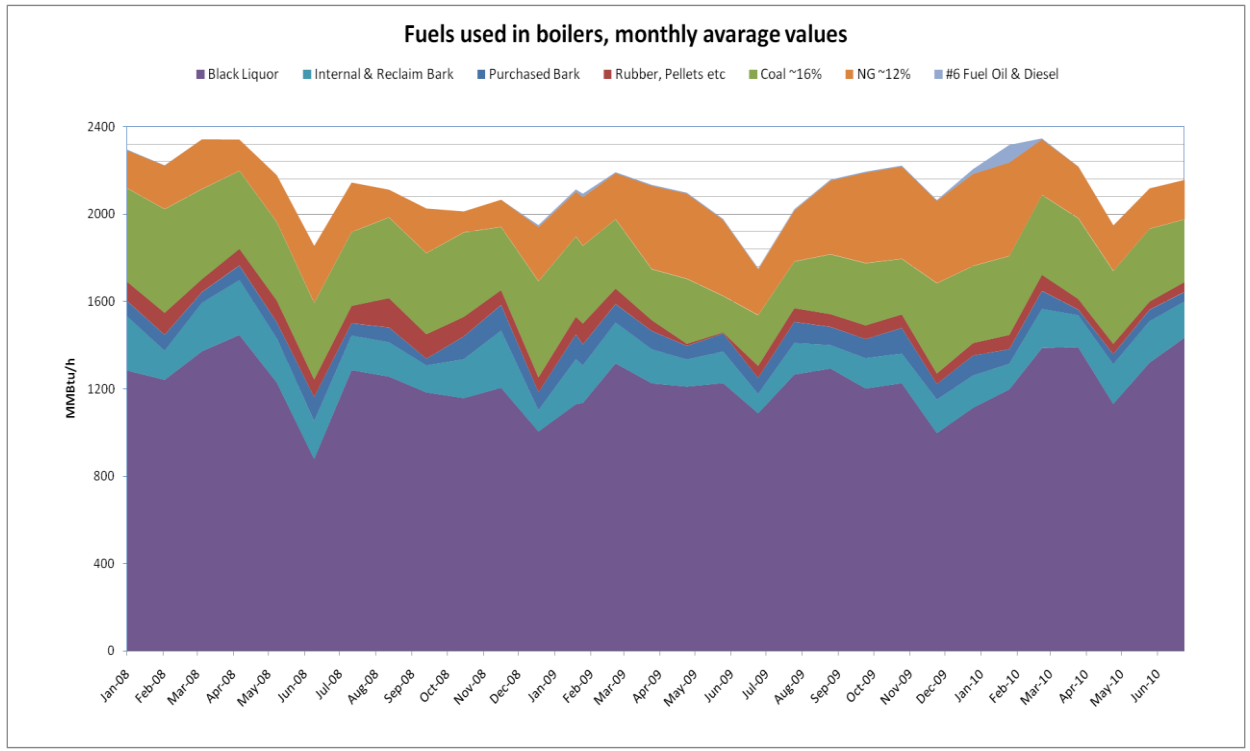
- Find out the overall and departmental energy performance of the mill – Key Performance Indicators

Industry best practices

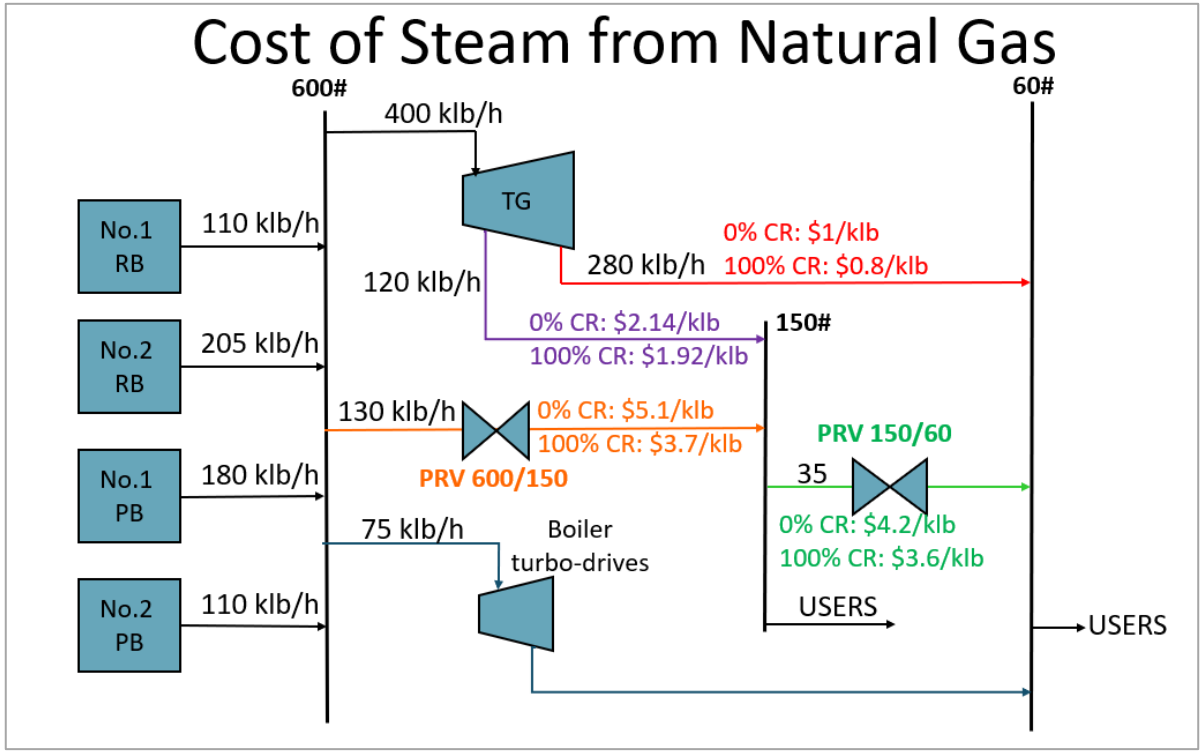
- Utilizing a large database of good industry practices as well as practical experience in pulp and paper industry

Economic Scenario Analysis

Steam origin



Marginal cost of steam



Thank you!

Lee Hill: lhill@americanprocess.com

Sofia Rouzinou: srouzinou@americanprocess.com

https://americanprocess.com