ION EXCHANGE RESINS AND ACTIVATED CARBON

RESINTECH

Troubleshooting Water Softeners

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Mar 14, 2013

W.R.B.A.
Western Regional Boiler Association

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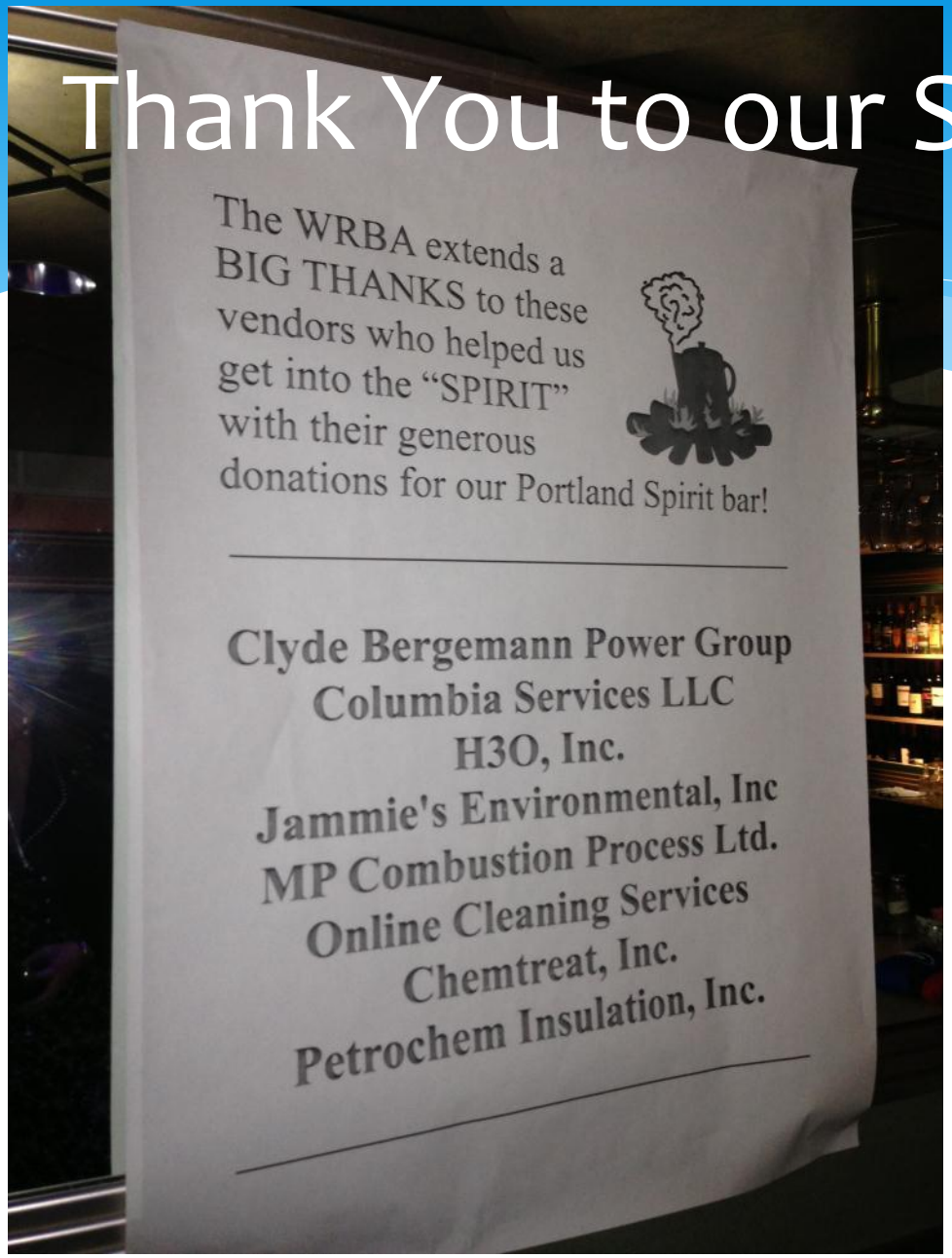
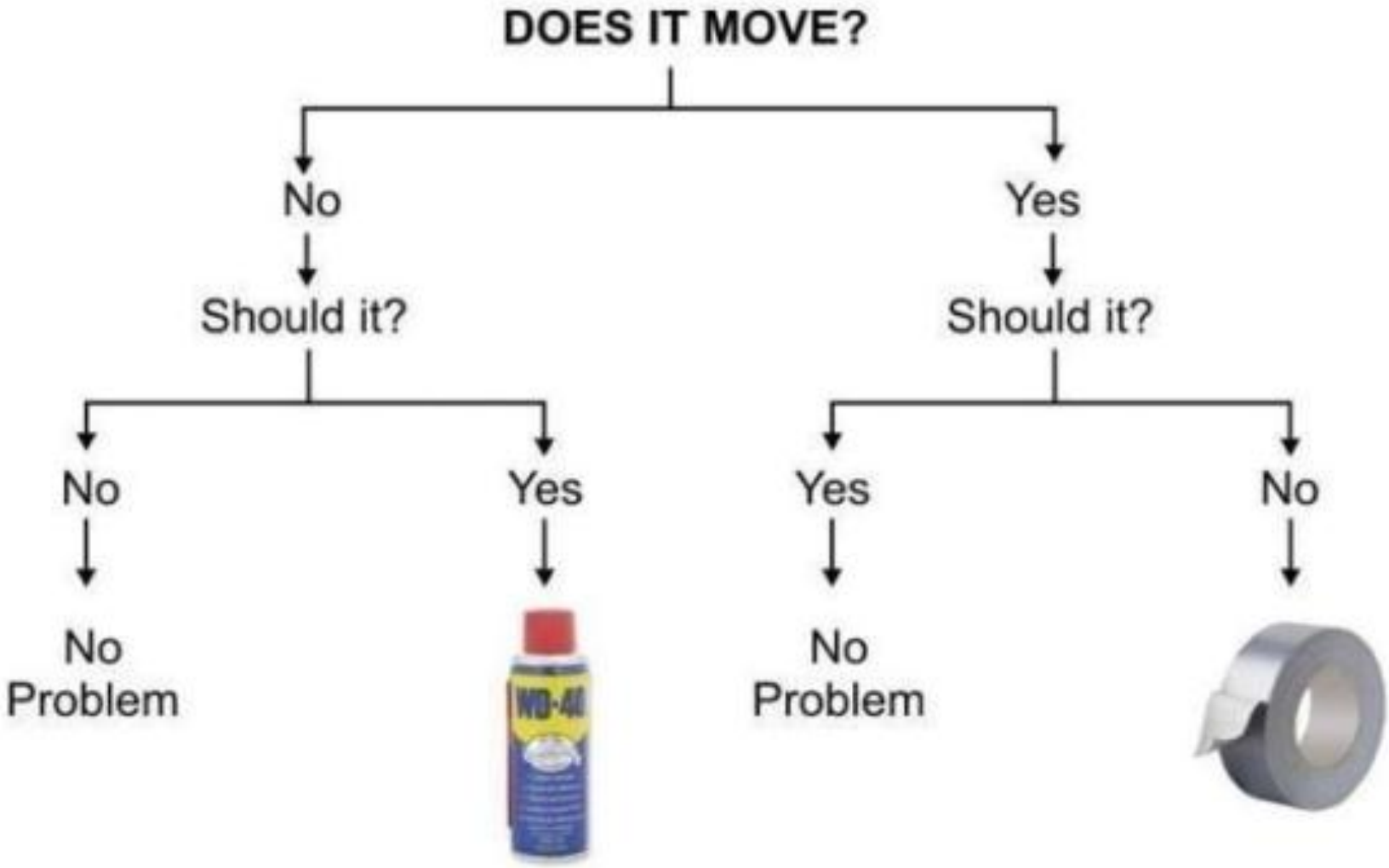


Troubleshooting Chart



Ion Exchange Softening

* The process by which hardness ions are removed from water and replaced by sodium ions.
* The most common hardness ions are calcium and magnesium.

Steps to Troubleshooting

* Listen, listen, listen!
* Someone at the plant always knows what is wrong!
  * What is really wrong?
  * What's been tried already?
  * Is the resin OK?
  * Is anything seriously broken?

Steps to Troubleshooting

1. Gathering data

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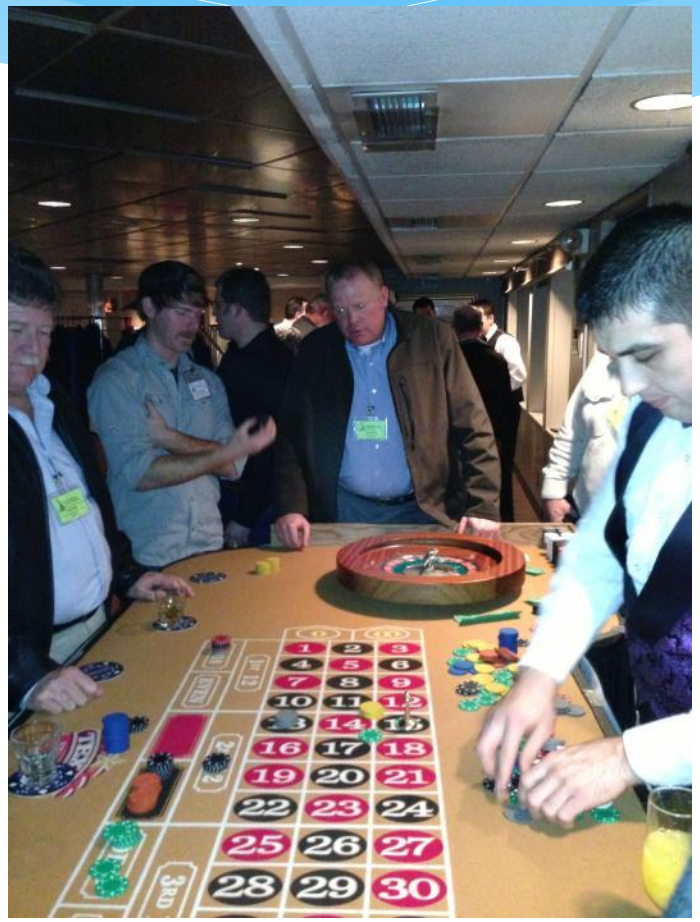
2. Creating a model



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1. Gathering data
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3. Comparison of the model against real world results

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2. Creating a model
3. Comparison of the model against real world results
4. Decisions about changes
5. Evaluation and follow up

Beer Troubleshooting

SYMPTOM	CAUSE	ACTION
Feet cold and wet	Glass being held at incorrect angle	Rotate glass so that open end points toward ceiling
Feet warm and wet	Improper bladder control	Stand next to nearest dog, complain about house training
Beer unusually pale and tasteless	Glass empty	Get someone to buy you another beer
Beer is crystal clear	It's water. Somebody is trying to sober you up	Punch him and get another beer
Hands hurt, nose hurts, mind unusually clear	You have been in a fight	Apologize to everyone you see, just in case it was them

What do we need to Know?

* TDS (or conductivity)
* pH and Temperature
* Basic inorganic analysis of ions (Ca, Mg, Na)
* Presence or absence of
  * Oxidants
  * Complexing agents
  * Organic molecules
  * Suspended solids
  * Iron and manganese

Basic Data About the System

* Tank Diameter and straight height
* Resin volume
* Resin type (and part number)
* Height of any internal pipeworks
* Upper distributor and underdrain
* Chemical distributors and/or collectors
* Pipe Sizes and design flow rates for each distributor
* Regeneration Schedule (all flow rates and times used)
* Service cycle run length

Create a model

* Sizes, volumes, capacities
  * Flows
  * Doses (chemical use)
  * Water quality
  * Efficiency
  * Waste Neutralization

What (if anything) is really wrong?

* Is the system doing everything it can?
* If not, was it ever actually right?
* Problems fall into general categories
  * Water quality
  * Throughput quantity
  * Chemical use

Types of Problems

* Event oriented
  * Something happened (broke, changed etc)
  * Performance suddenly changed
* Time oriented
  * Things got worse over time
* Tricky to differentiate
  * Operators tend to ignore small problems

    until they get to a certain size,

    thus time oriented problems can be represented as event oriented.

Why Differentiate?

- Event oriented problems generally have simpler solutions
  - Fix something broken
  - Replace resin
- Time oriented problems may not be easily solvable
  - Slow deterioration of water quality
  - Wearing out of equipment

Why Construct a Model?

* Ideal Operation provides a benchmark to use to compare how bad (or good) things are

* Helps decide what changes offer the most chance of improvement and best potential reward

Study the model

* Look for things that are wrong or that are less than optimum
* Look for things that could be improved
* No idea or suggestion is too stupid or worthless to consider at this point
* Ask the plant people what they would do, what they have talked about, what they may have tried

Make a List

* Assign for each viable remedy
  * Cost
  * Risk
  * Potential Reward

Decide what to suggest

* If many things are wrong, choose one or two things with the biggest potential reward
* Stay away from risky solutions unless the client is fully aware of the risks
* Make suggestions that have a reasonable chance of being implemented

Follow Up

* All too often we make a change, things get better, and we move on to other problems without taking time to follow up
  * Did the change result in the degree of improvement predicted?
  * Did anything else change that may have accounted for the improvement
  * What other changes should also be implemented?

Monitoring Performance
Softeners

* Feedwater hardness
* Effluent hardness
* Differential pressure
* Run length, gallons
* Amount of salt used
* Rinse water, gallons

Resin Sampling

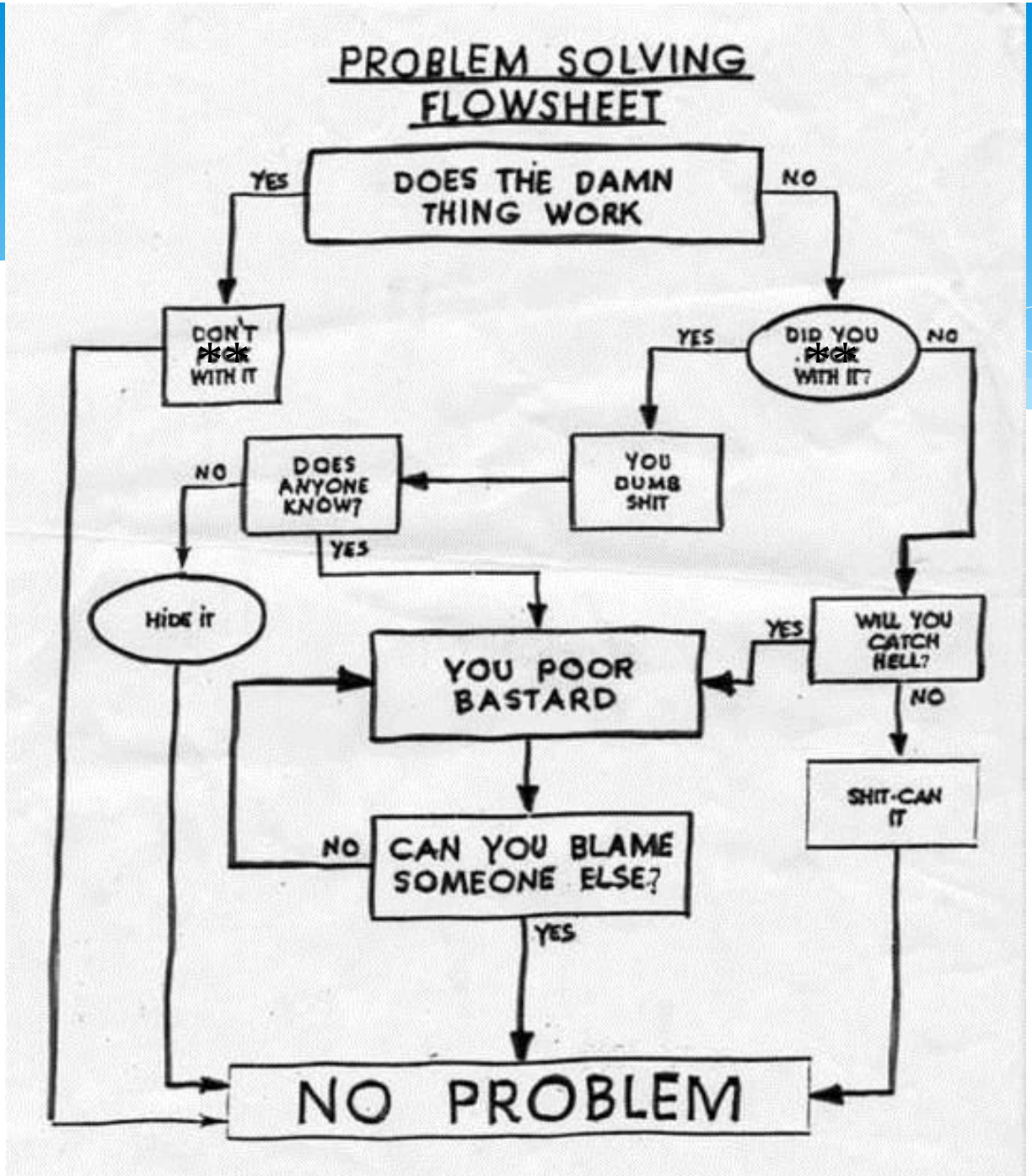
* Core Sample
* 1 Quart
* Proper Label
  * Name, Address and Phone number
  * Sample ID
  * Kind of resin / Model Number
  * Application
  * Age
  * Regenerated or Exhausted
  * Reason for analysis

Resin Testing Results

- Routine Tests
  - Capacity
  - Salt splitting capacity (anion)
  - Moisture Content
  - Whole Bead Count
- Optional Tests
  - % Conversion
  - Effect of Cleaning
  - Mix Ratio
  - Quality Rinse-up
  - Screen Analysis

Softener Troubleshooting

SYMPTOM	CAUSE	ACTION
High Pressure Drop	Solids buildup	Inspect top of bed, perfrom vigorous backwash
	'Soft' resin beads	Test resin, replace if oxidized
Short Runs	Resin loss	Measure bed height, check internals, check backwash flow rate
	Low resin capacity	Test resin, replace if total capacity is low, or resin is oxidized
Short Runs/Hardness Leakage	Improper regeneration	Check brine tank for salt, perform elution study


PROBLEM SOLVING FLOWSHEET
DOES THE DAMN THING WORK
YES
NO
DON'T fuck WITH IT
DID YOU fuck WITH IT?
YES
NO
YOU DUMB SHIT
DOES ANYONE KNOW?
NO
YES
HIDE IT
WILL YOU CATCH HELL?
YES
NO
YOU POOR BASTARD
SHIT-CAN IT
NO
CAN YOU BLAME SOMEONE ELSE?
YES
NO PROBLEM

Discussion & Questions

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