NEW PROCESS TECHNOLOGY

PROPER STEAM CONDITIONING AND CONTROL

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2001 AFIA Feed Production School
Indianapolis, IN
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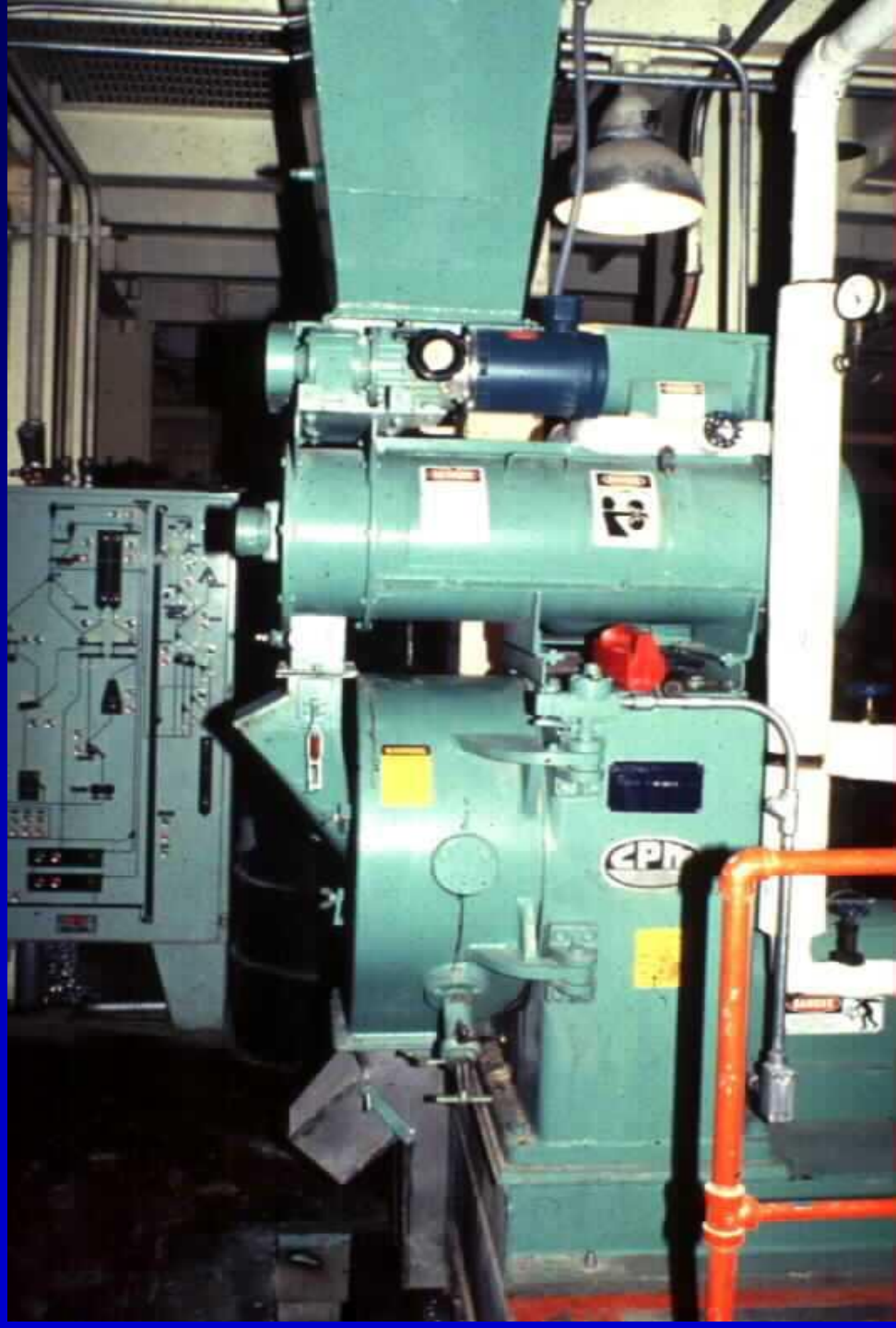
PELLETING

Myths vs Facts



ISSUES IN PELLETING?

PELLET QUALITY

VS

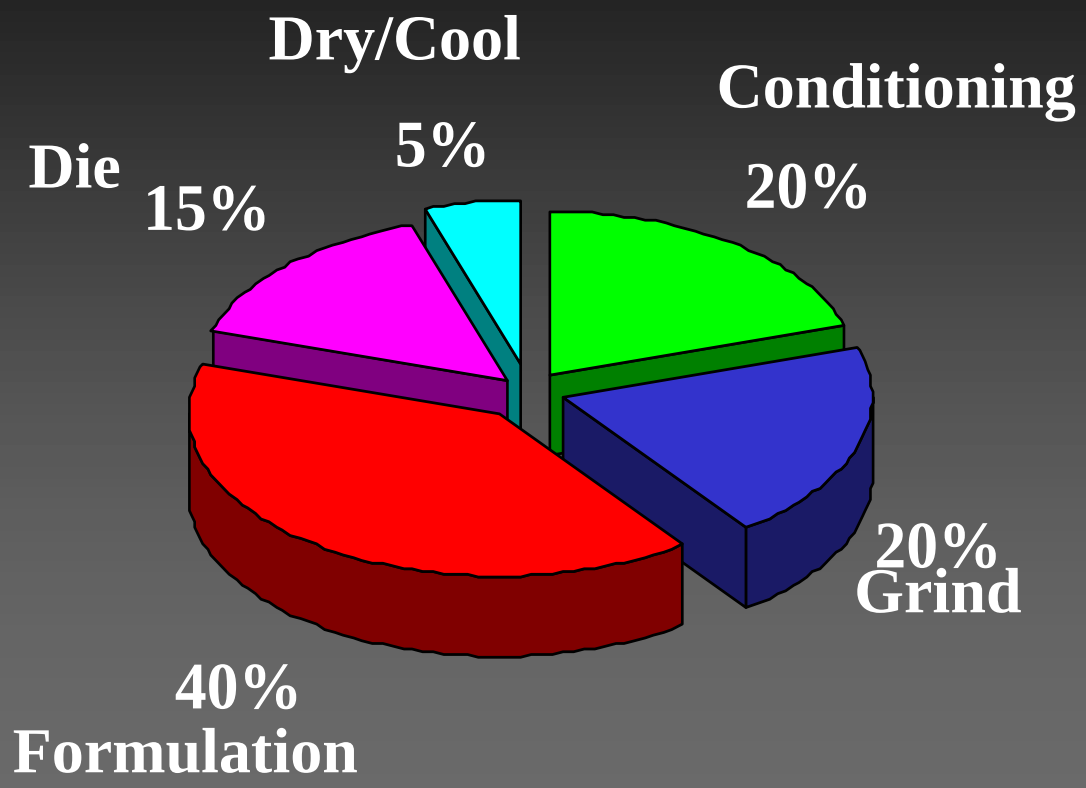
PRODUCTION RATE

PELLET QUALITY

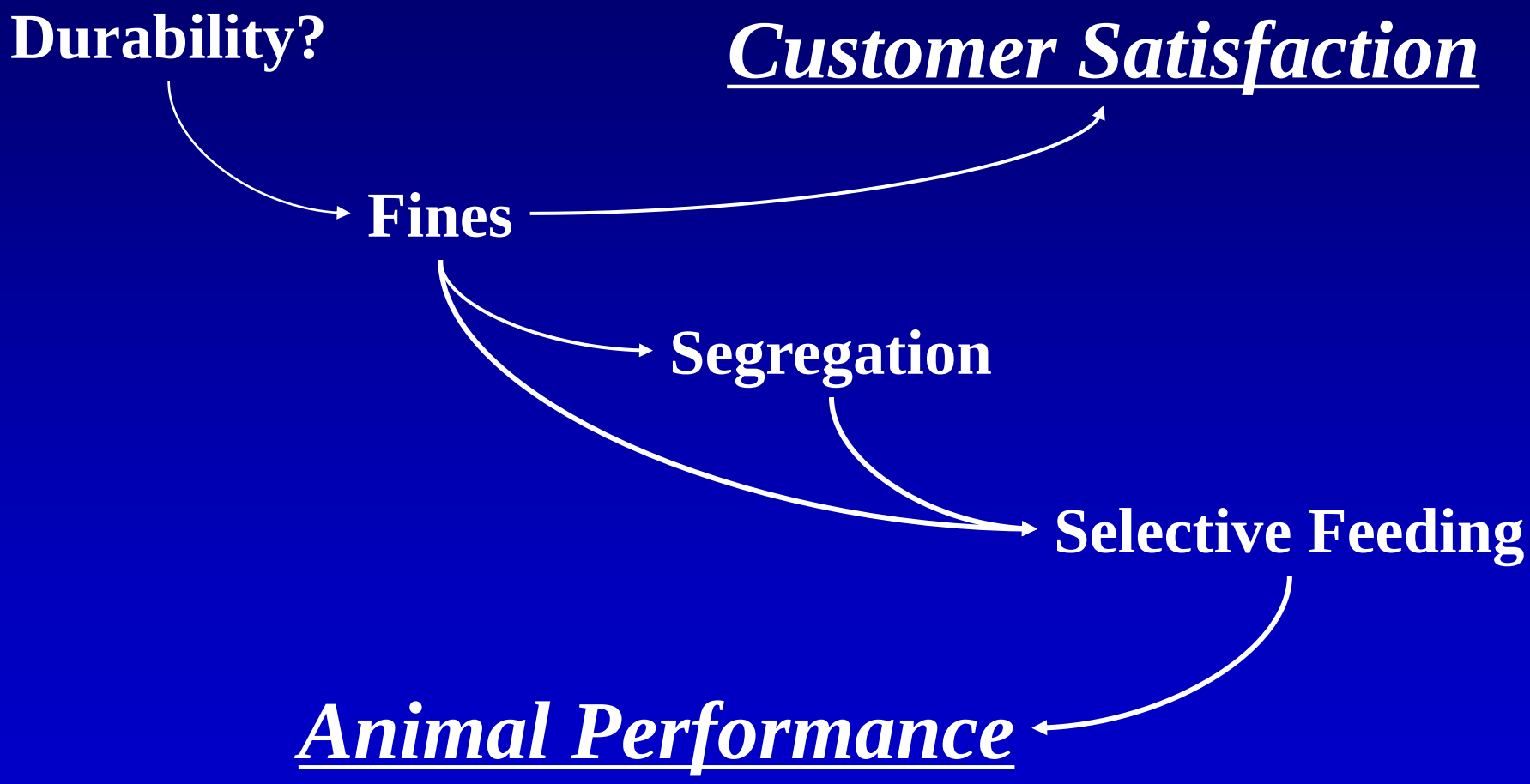
IS:

…the ability of pellets to take handling without generating excessive fines.

PELLET QUALITY FACTORS



Pellet Quality Issues



PELLET QUALITY FORMATION

Pellet Quality is *Primarily* Established in the Conditioner,

***Not* in the Pellet Die.**

FORMULATION

Diet formulation is based on meeting the nutrient requirements of the animal at the *least possible cost* per ton.

Little consideration for:

-Pellet Quality

-Production Rate

CONDITIONING:

....any modification or addition made to the mash after it leaves the mixer *and* before it reaches the pellet die chamber...

MAJOR FACTORS AFFECTING PRODUCTION RATE and PELLET QUALITY

Steam Conditioning

The level of steam conditioning possible depends on the:

-Formula moisture content
-Formula fat/oil content
-Steam quality
-Die resistance and condition
-Roll surface and condition

MAJOR FACTORS AFFECTING PRODUCTION RATE and PELLET QUALITY

Steam Conditioning

As a rule, the higher the level of conditioning,

the higher the throughput and pellet quality.

Condensed steam acts as a lubricant
(up to a point!!)

STEAM CONDITIONING

Steam has the ability to carry and transfer

both heat and moisture efficiently through

the process of **“CONDENSATION”.**

STEAM CONSIDERATIONS!!

-Quality?

*Insulation

*Traps

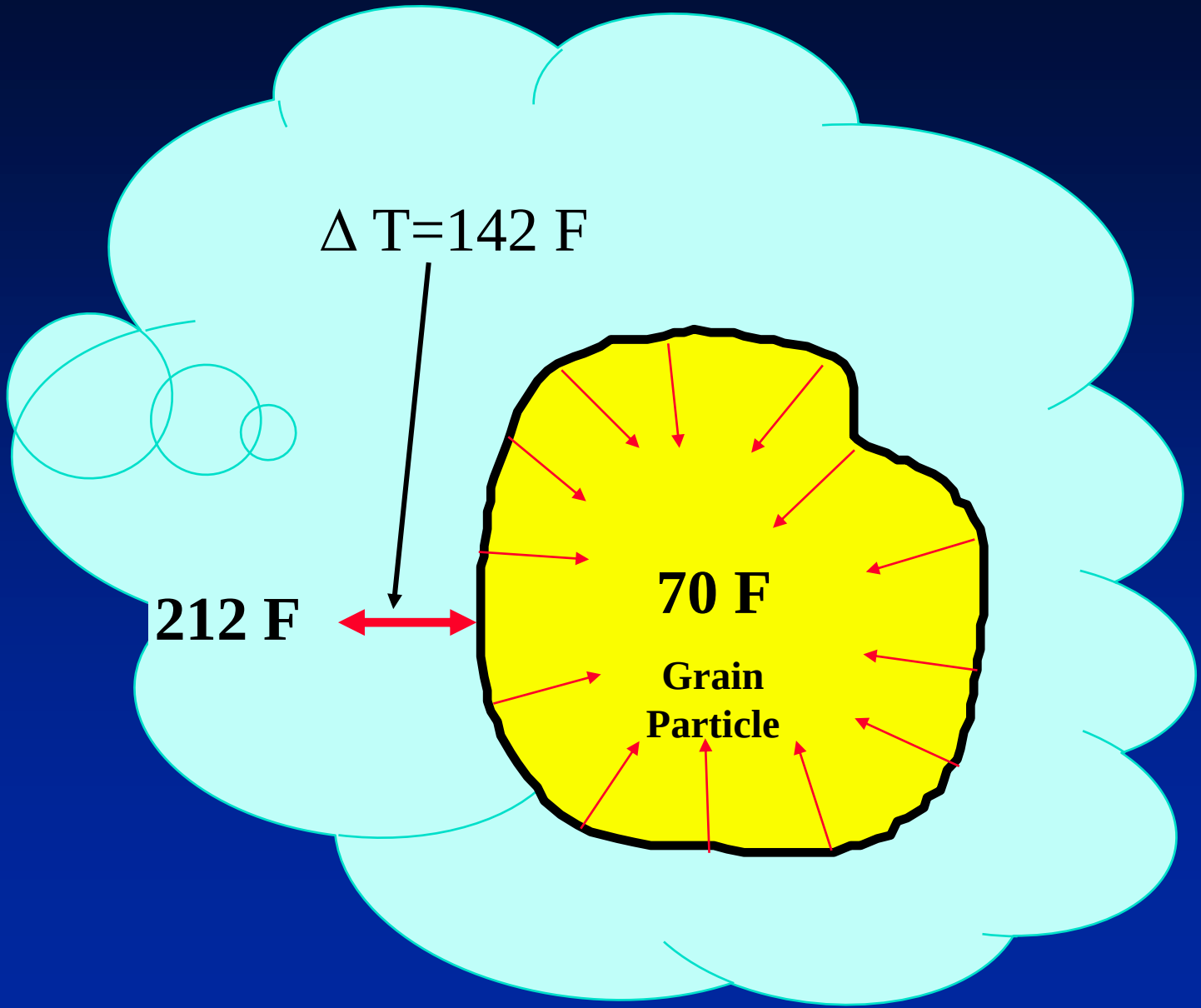
*Valves

-Pressure?

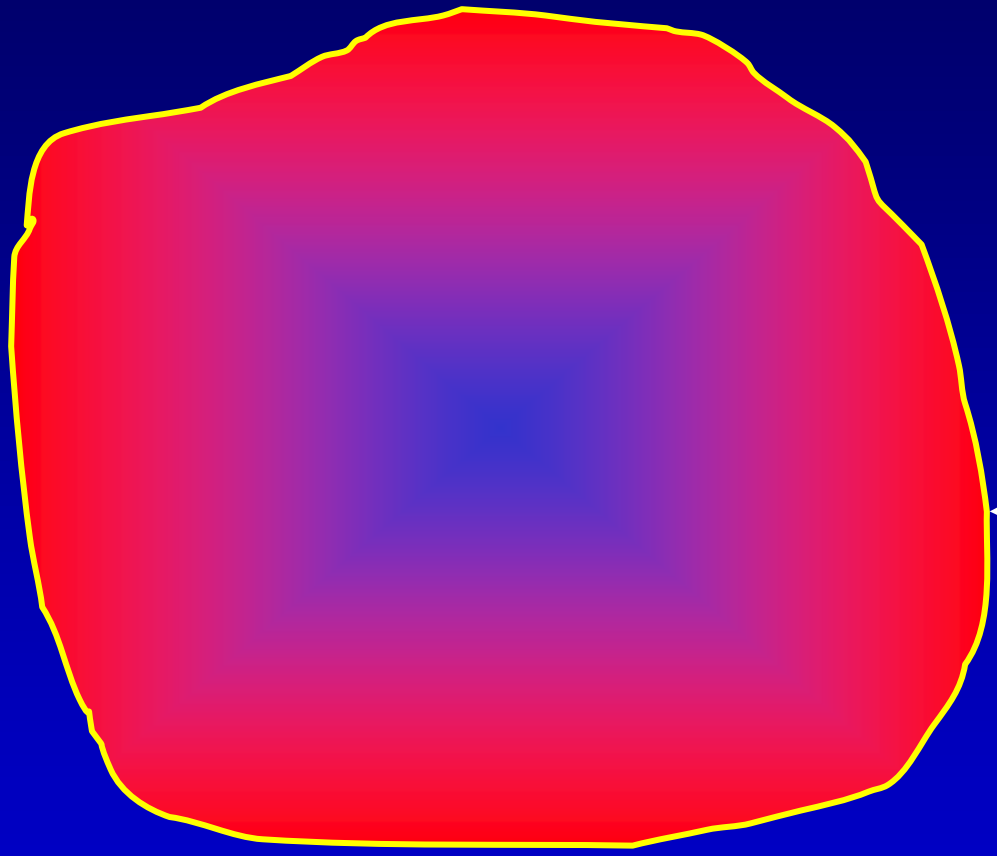
*Constant not Fluctuating

*Makes little difference in heat content.

STEAM CONDENSATION



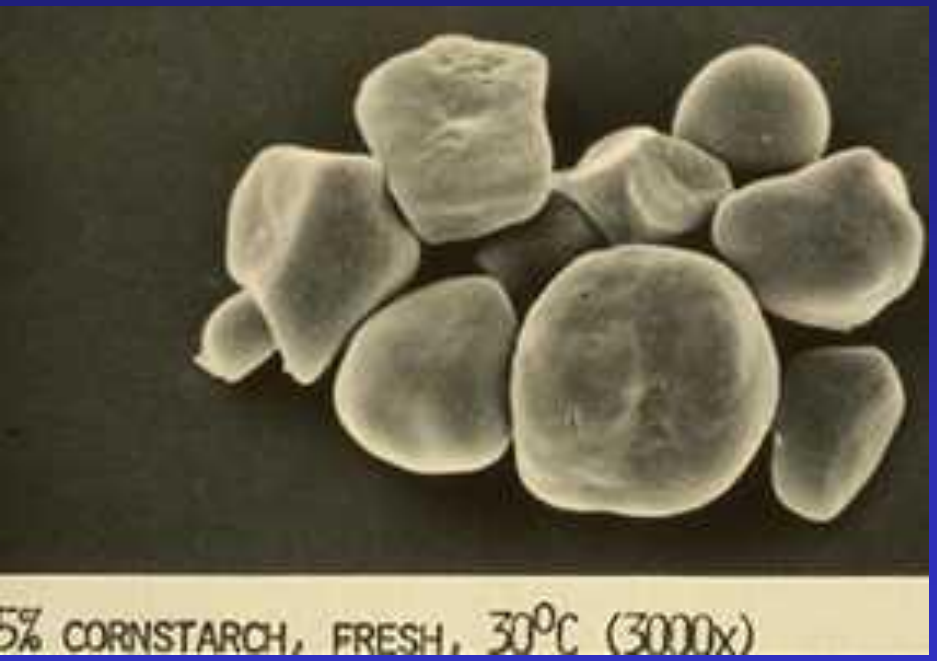
HEAT/MOISTURE DIFUSION

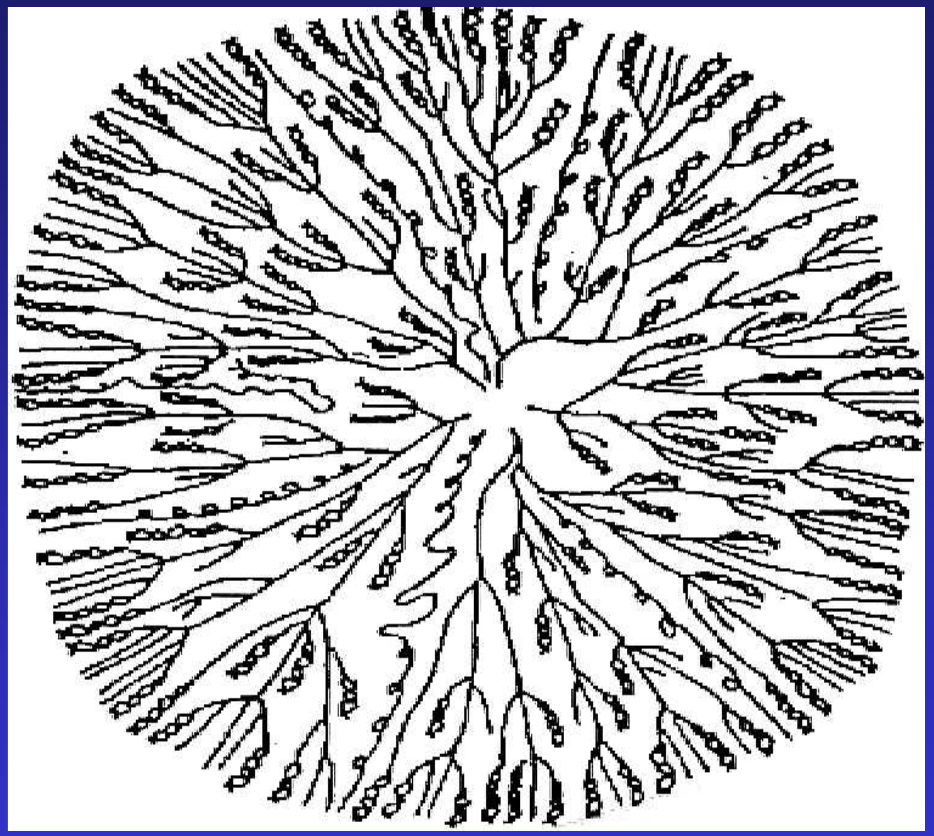


Starch at the surface of
The particle is gelatinizes
And becomes soluble

TIME!!!!

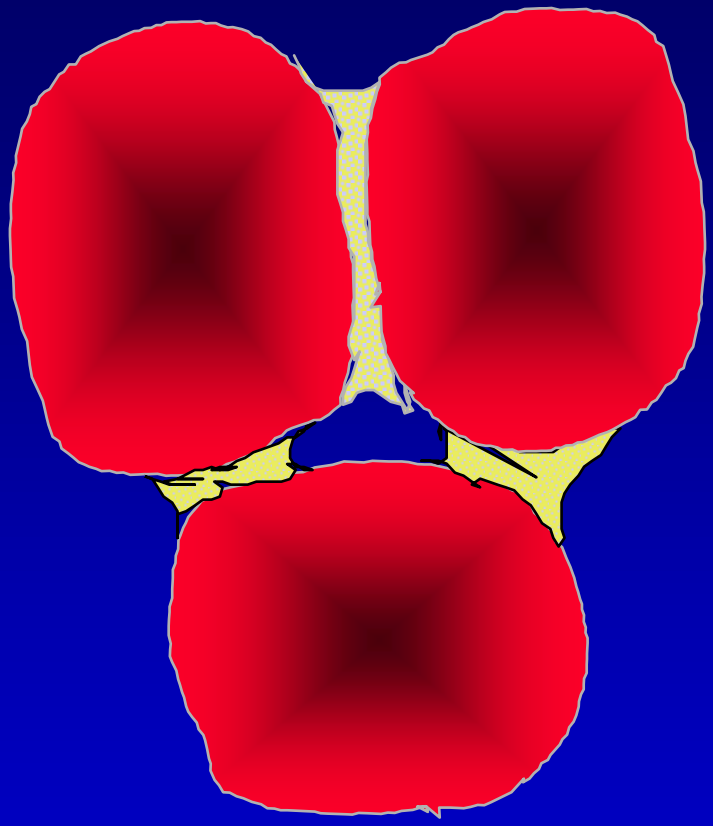
Starch Granules



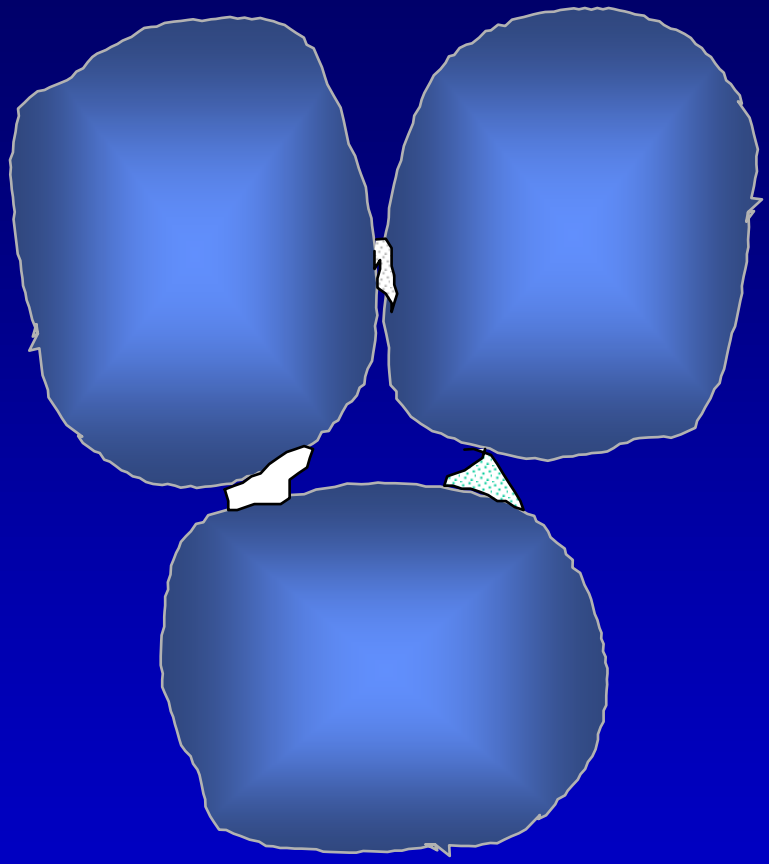


Amylopectin Molecule

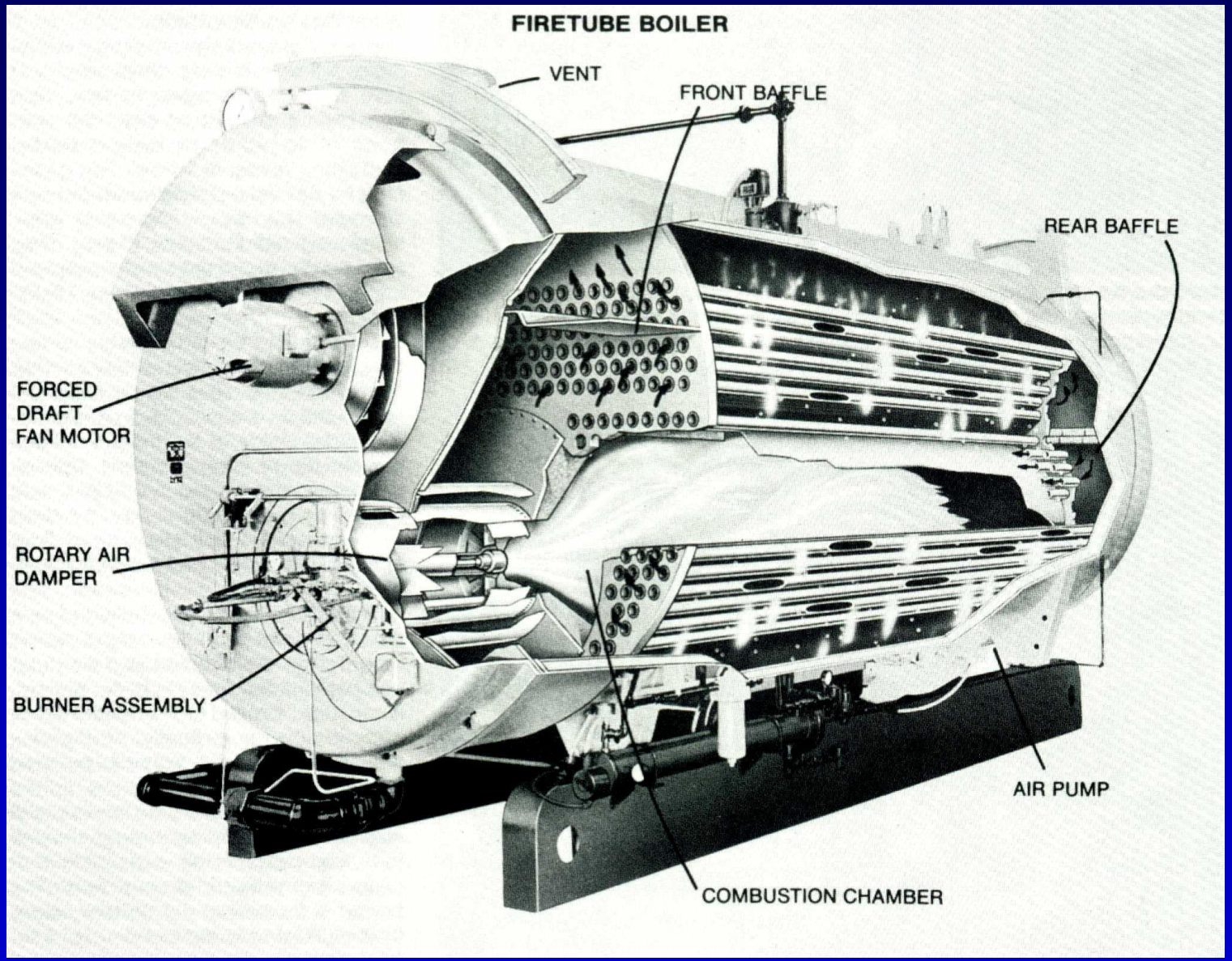
PARTICLE ADHESION

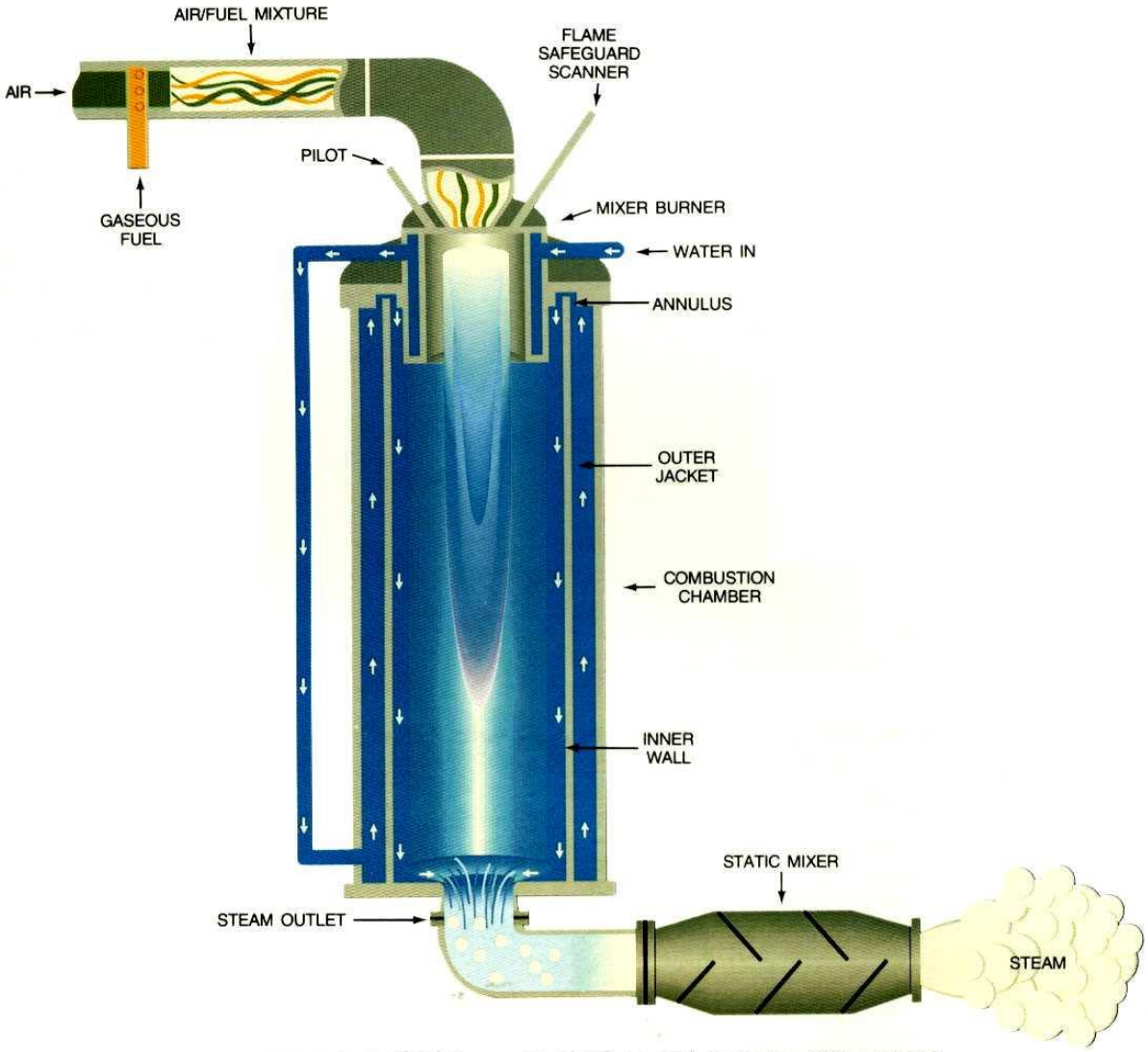


HOT/MOIST
CONDITIONING



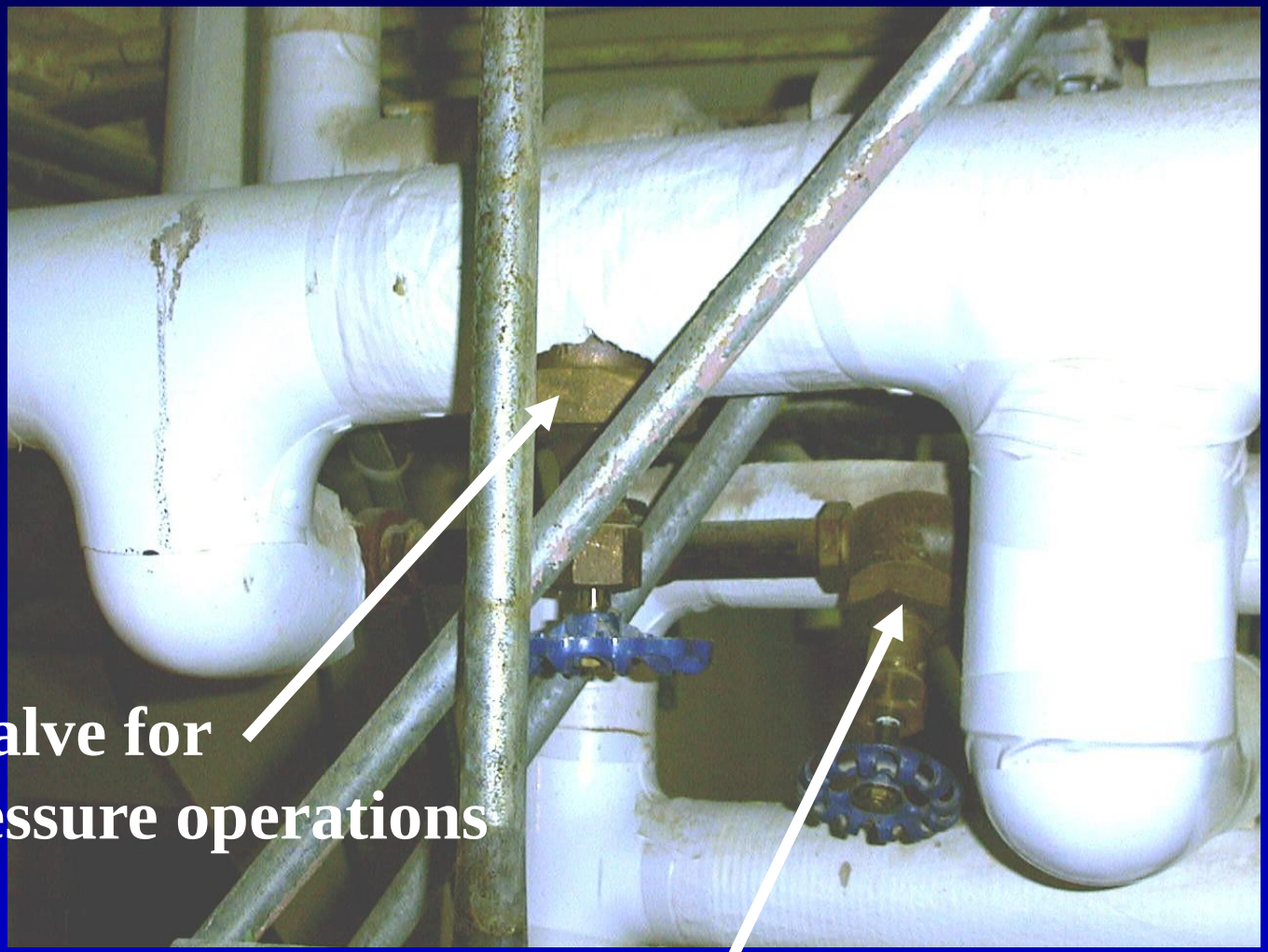
COOL/DRY
CONDITIONING


FIRETUBE BOILER
VENT
FRONT BAFFLE
REAR BAFFLE
FORCED DRAFT FAN MOTOR
ROTARY AIR DAMPER
BURNER ASSEMBLY
AIR PUMP
COMBUSTION CHAMBER



HYDROFIRE — INSTANT HOT WATER VAPORATOR — INSTANT STEAM

Steam Fittings, Piping And Control Valves



Large valve for
Low pressure operations

Small valve for
High pressure operations

STEAM SYSTEM DESIGN

*** Size supply piping so that steam velocity is About 100 ft/sec.**

•Install a steam trap at every low point.

•Insulate entire system, including valves, to reduce heat loss.

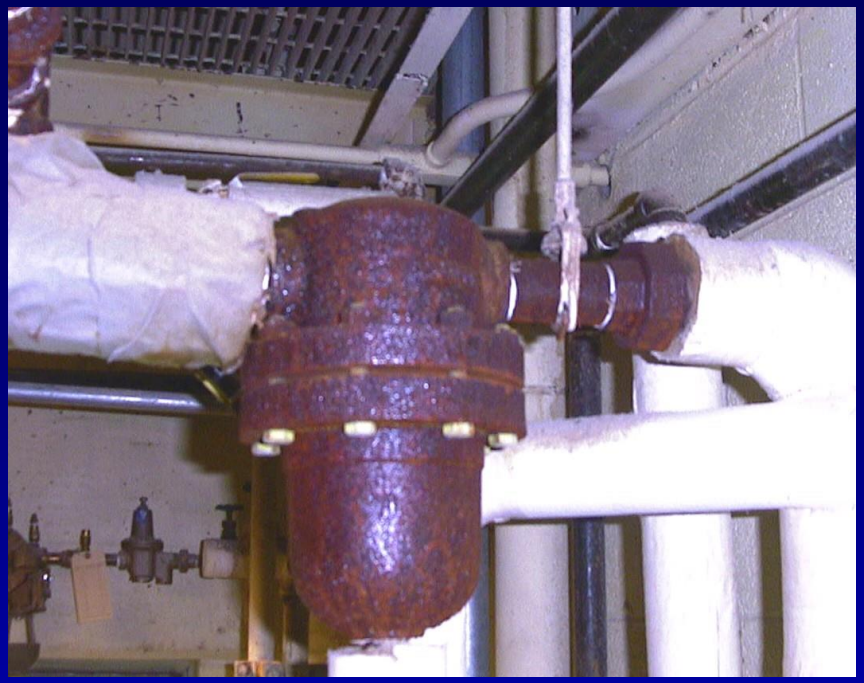
•Final pressure reducing station should be no closer than five yards from use point.

STEAM SYSTEM DESIGN

- **Control valves must be sized to give reasonable control of steam flow at the intended use pressure.**

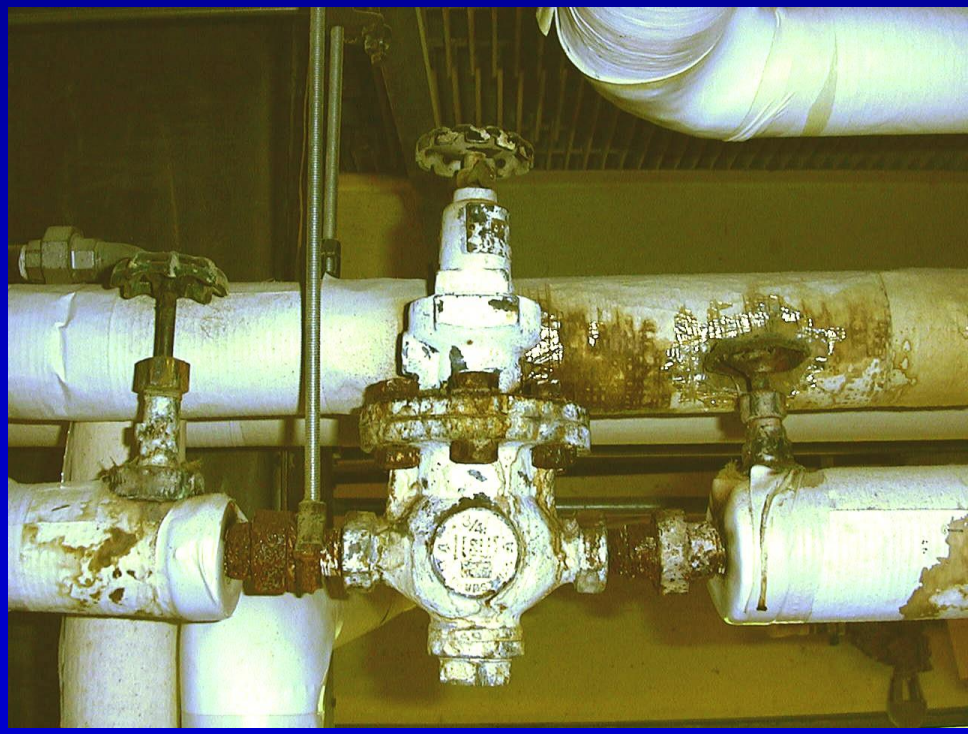
- **If automatic pelleting is used, make sure the control valve and orifice is sized right and that the proportioning response is appropriate.**

PRESSURE REGULATION
AND
STEAM QUALITY CONTROL



Steam Separator
(upstream from
Pressure regulator)

Pressure Regulator

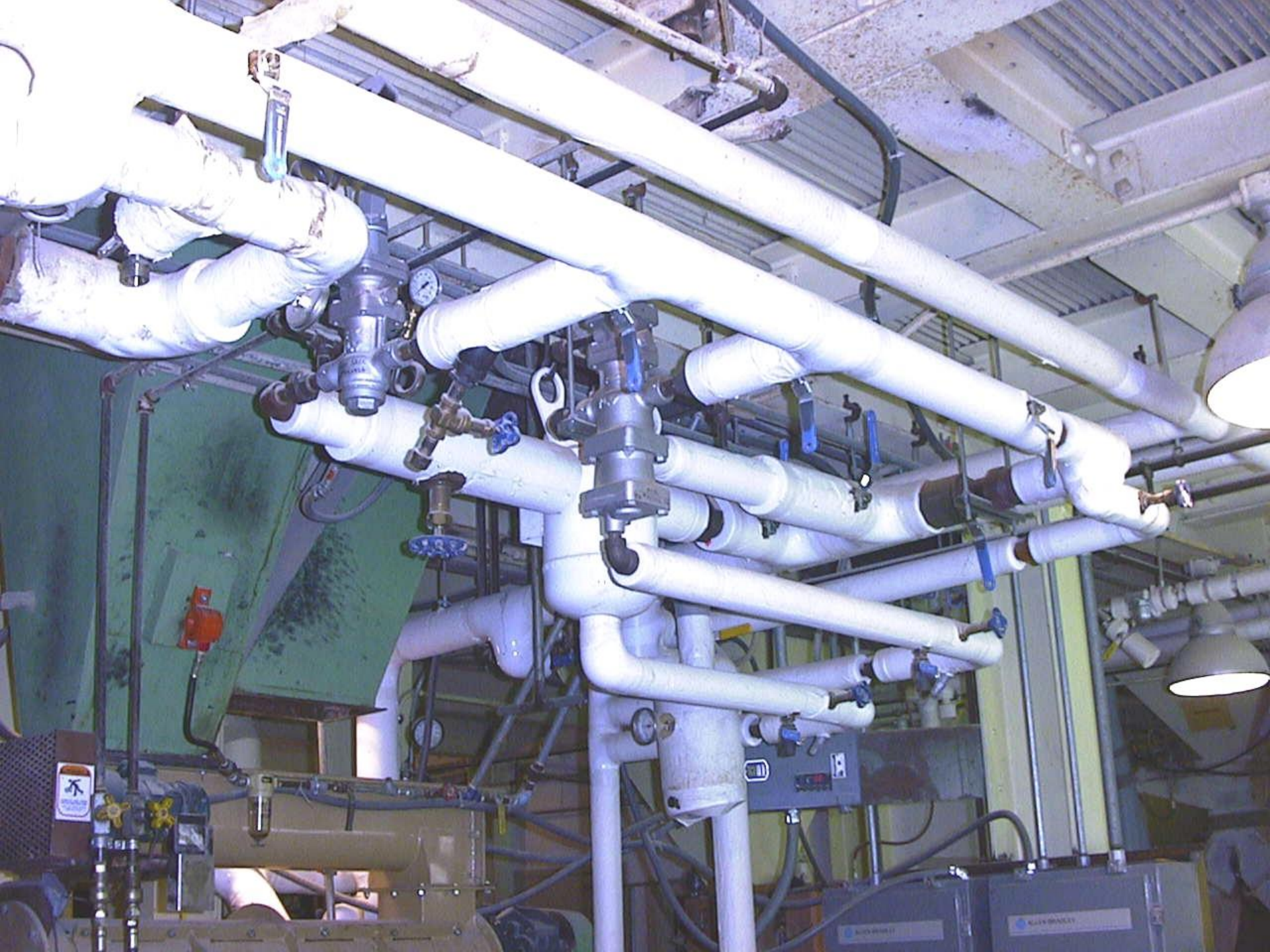


Combined Pressure Regulator And Strainer

“PURIFIER” Steam Separator

(down stream from Pressure regulator)

Combined Pressure Regulator, Separator, and Trap



HIGH vs LOW PRESSURE STEAM

Does it really matter??

Major Concerns are:

-Pipe and Valve Sizing and System Design.

- Little difference in Heat Content

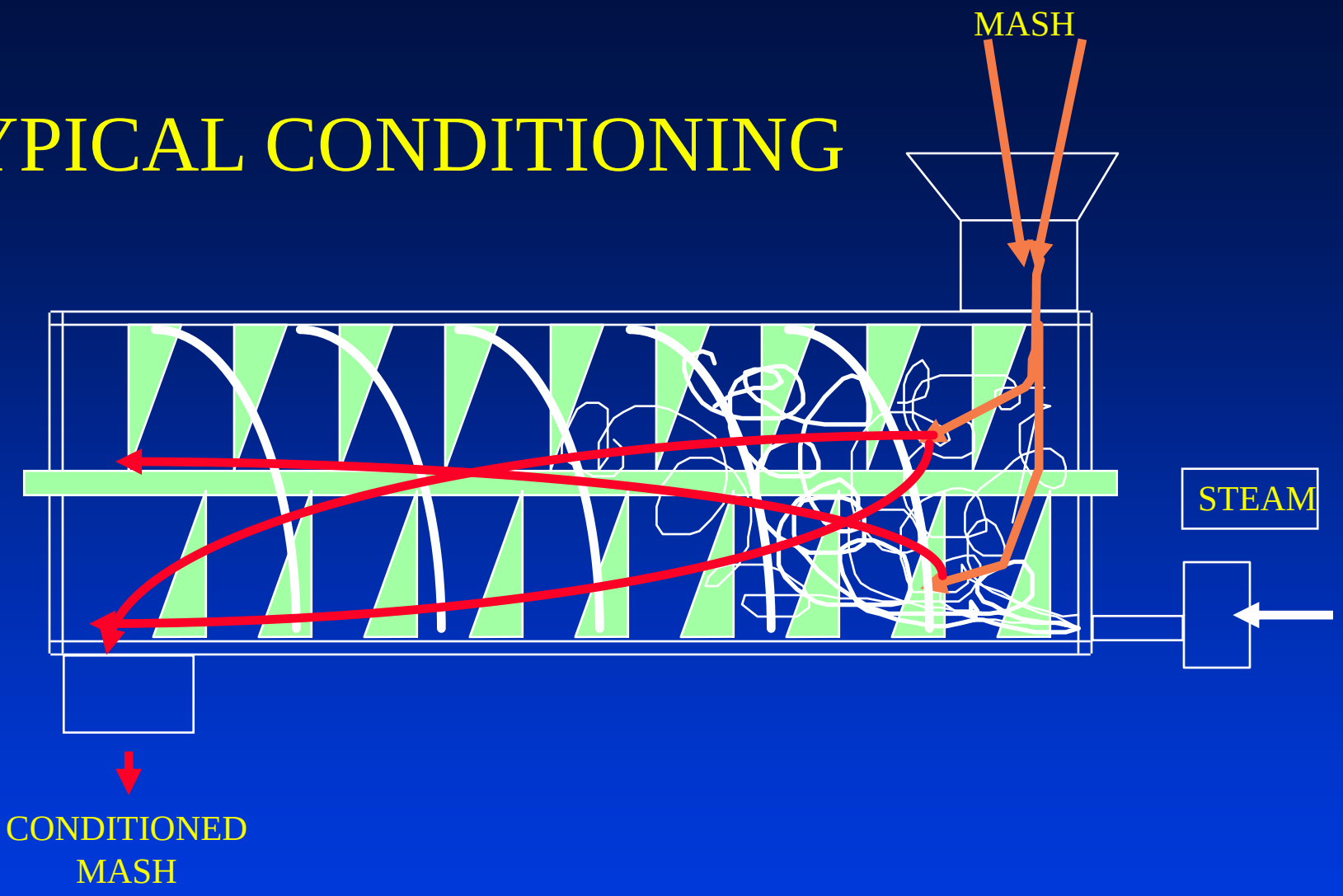
CONDITIONER DESIGN, SELECTION AND OPERATION

CONDITIONING ALTERNATIVES

- Steam Addition-----Atmospheric.
- -----Pressure.
- Water Addition.
- Expanding.
- Compacting.
- Re-Pelleting.
- Ripening.

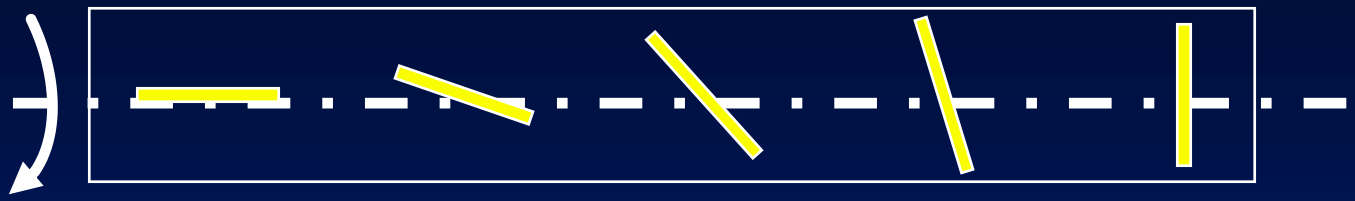
JACKETED CONDITIONER

TYPICAL CONDITIONING



CONDITIONER OPTIONS
RENTENTION TIME

1. Conditioner Volume- L x W
2. Pick (paddle) Angle.
3. Shaft Speed.



0 15 45 75 90

Pick Angle (degrees)

PADDLE ANGLE ADJUSTMENT

CONDITIONER VOLUME

Large Length to Diameter Ratio

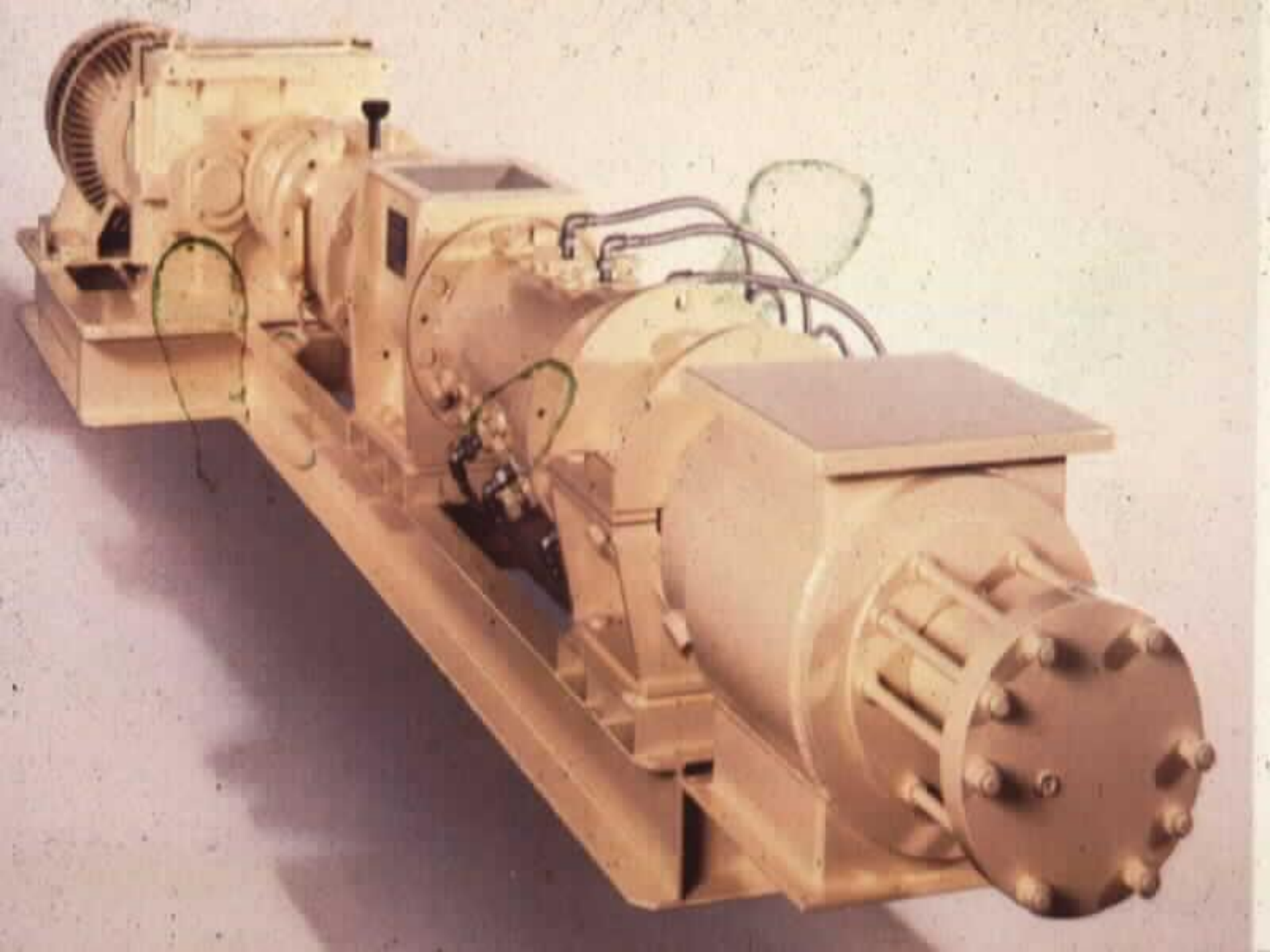
VS

Small Length to Diameter Ratio

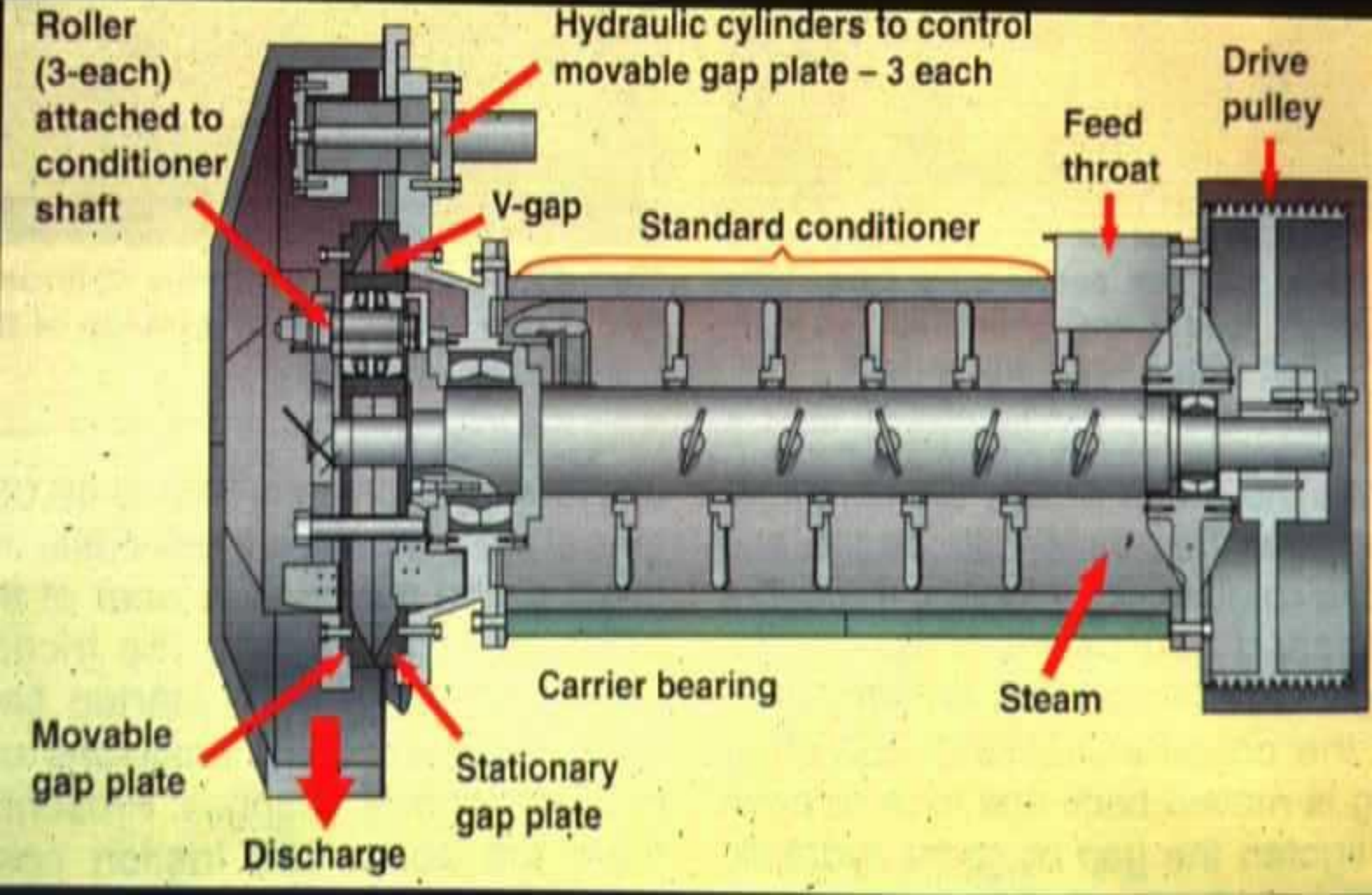

906.1
906.2
907

EXOTIC CONDITIONING

EXPANDERS

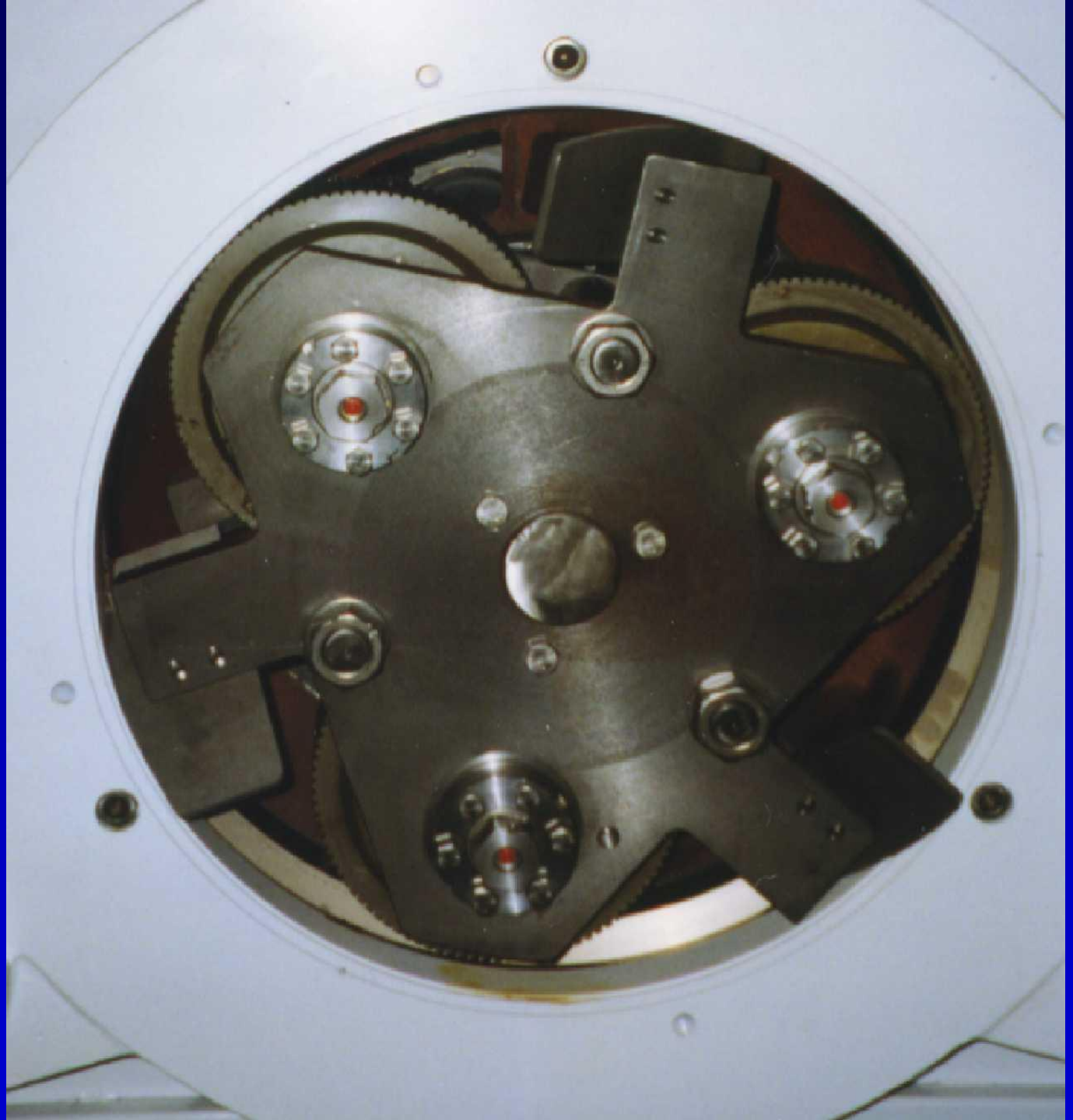


COMPACTOR


Roller (3-each) attached to conditioner shaft
Hydraulic cylinders to control movable gap plate – 3 each
Drive pulley
Feed throat
V-gap
Standard conditioner
Carrier bearing
Steam
Movable gap plate
Stationary gap plate
Discharge

BOA COMPACTOR

Compactor Roll Assembly



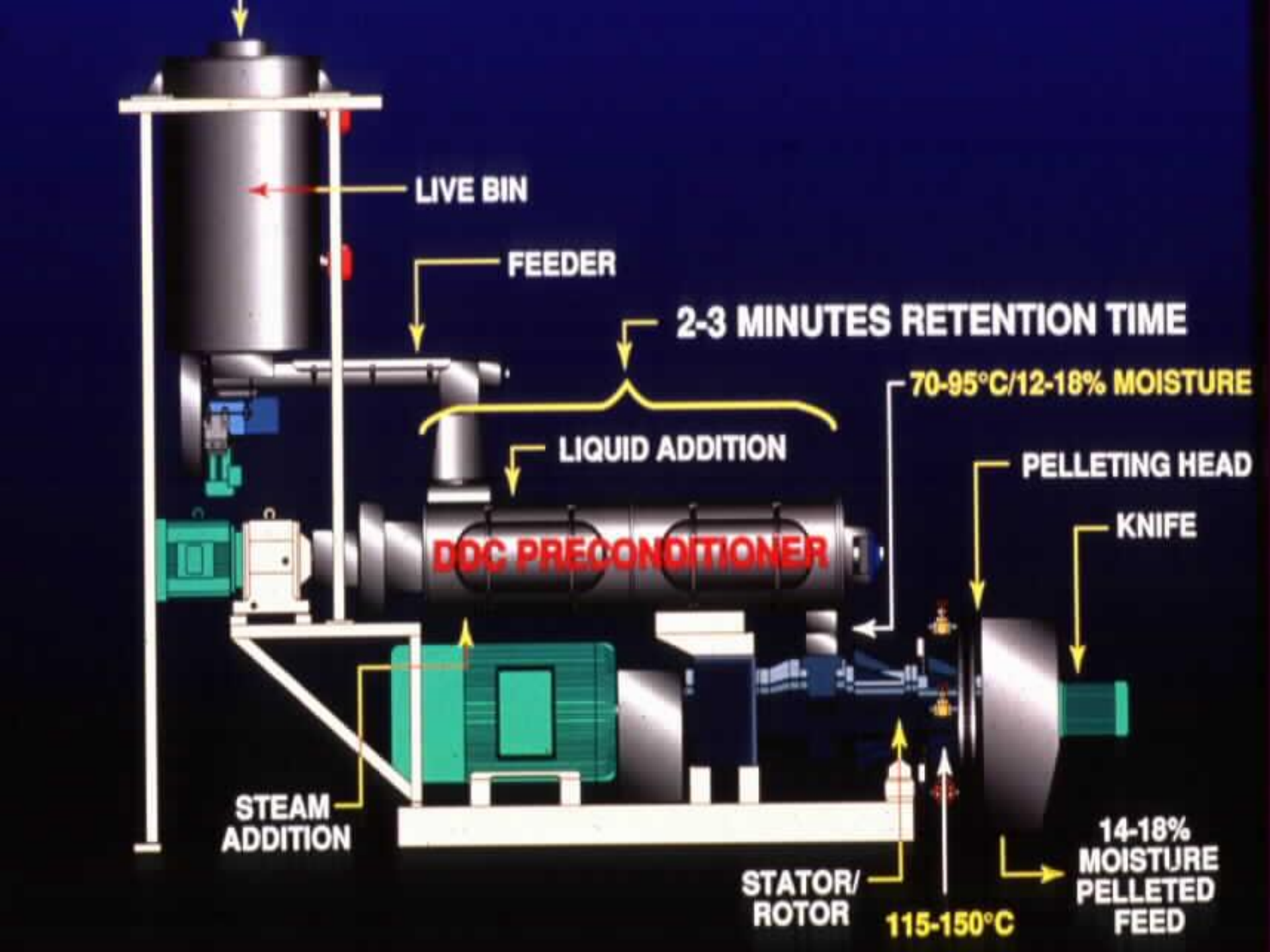
THE FUTURE!

PELLETING AND OTHER HYDROTHERMAL PROCESSES

UNIVERSAL PELLET COOKER

The “UPC”

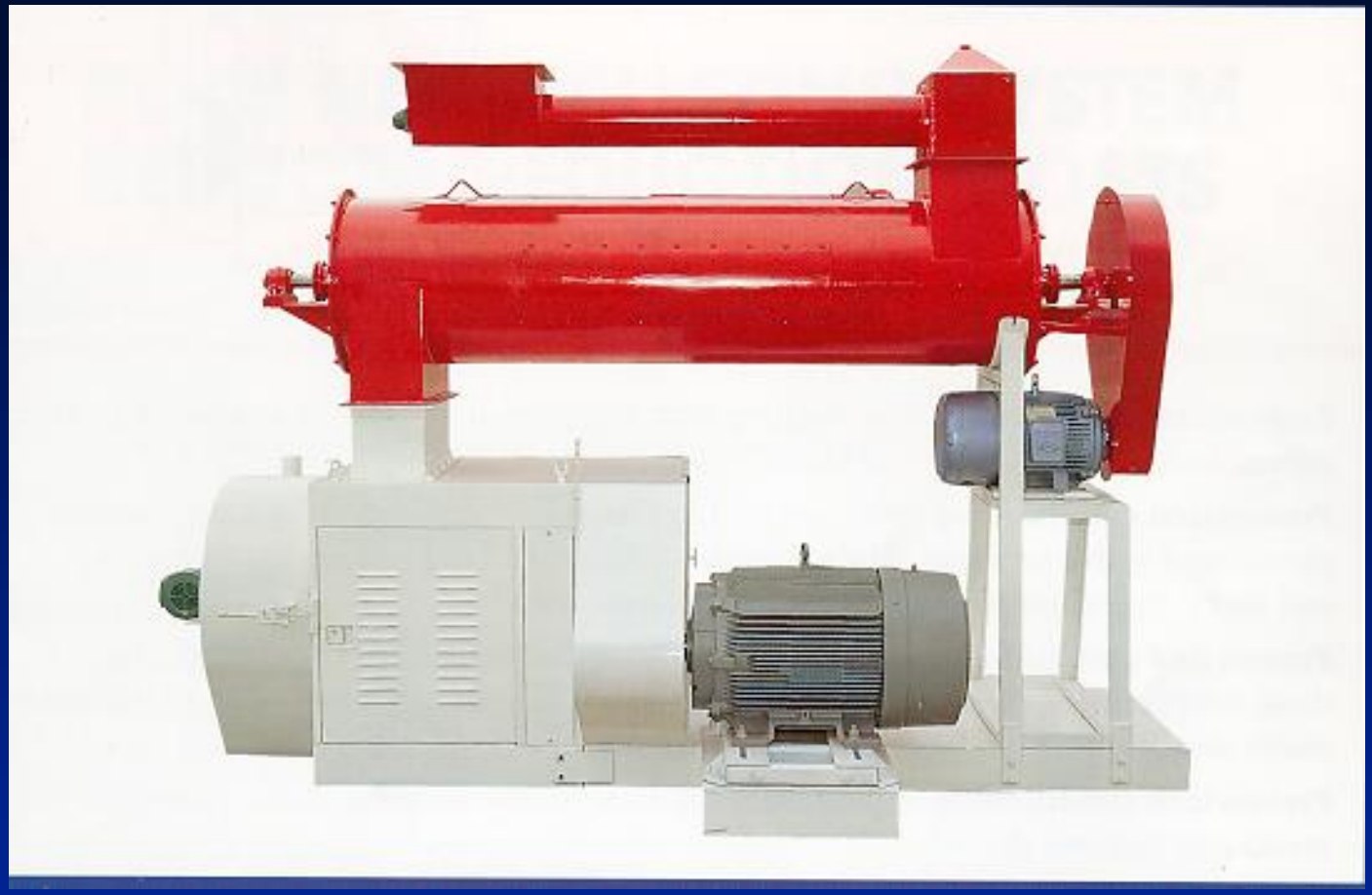
Wenger Manufacturing
Sabetha, KS


LIVE BIN
FEEDER
2-3 MINUTES RETENTION TIME
70-95°C/12-18% MOISTURE
LIQUID ADDITION
PELLETING HEAD
KNIFE
DDC PRECONDITIONER
STEAM ADDITION
STATOR/ ROTOR
115-150°C
14-18% MOISTURE PELLETED FEED

THE FUTURE!

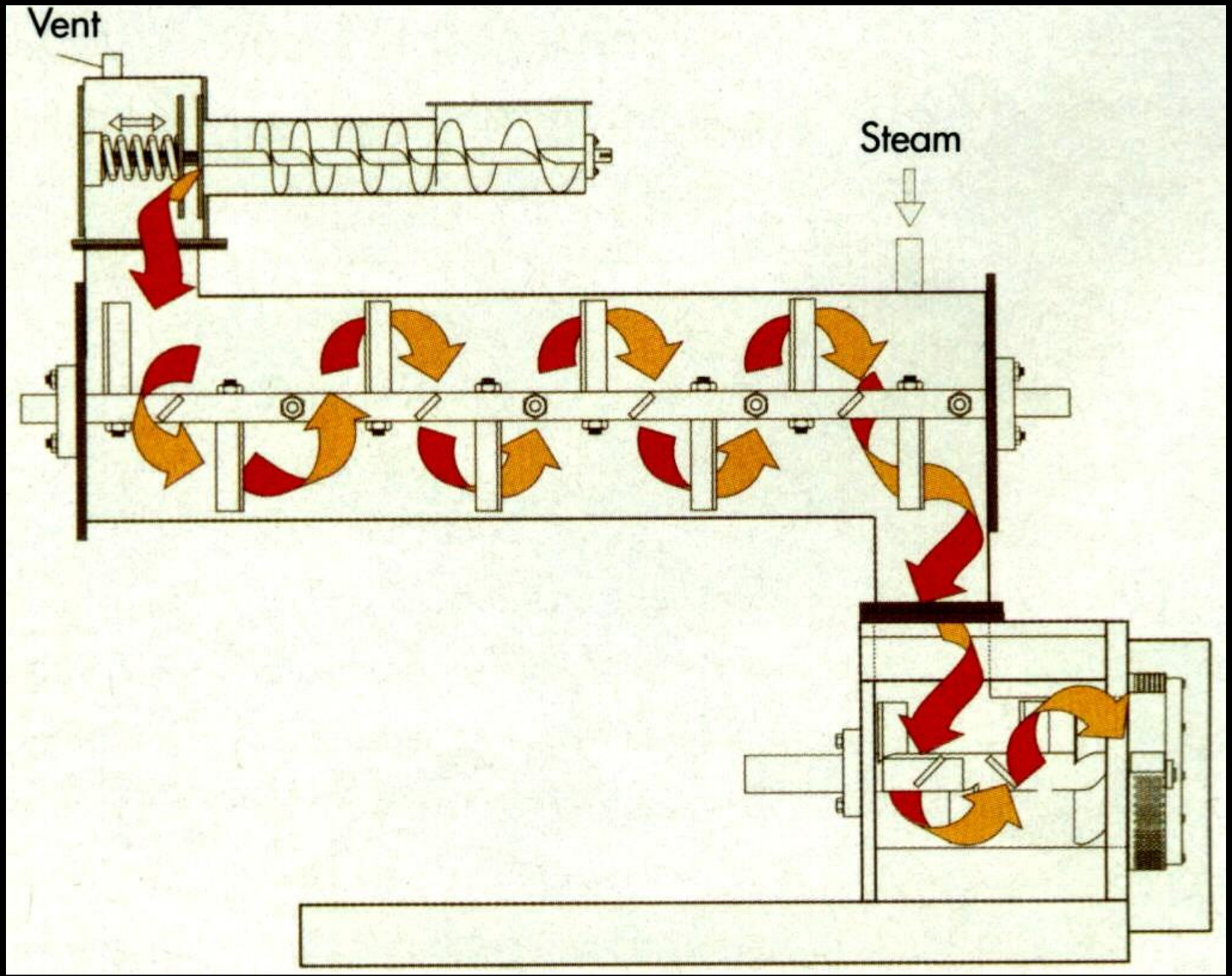
PELLETING AND OTHER HYDROTHERMAL PROCESSES

Pressure Pelleting



PRESSURIZED CONDITIONING

PCI, Inc. Wichita, Ks.


Vent
Steam

In-Line Moisture Control

The Effect of Precise Moisture Control on Pelleting Operations

OBJECTIVE:

To determine if precise moisture control at the Mixer would affect pellet mill operations and pellet quality.

PROCEEDURE:

1. Corn was low-temp. dried and ground through a 8/64” HM screen.
2. Feed Type- corn-soy pig finishing ration.
3. Feed mixed in a 1,000 lb (454 Kg) ribbon mixer.
4. Pelleting done w/ a CPM Master model pellet mill equipped w/ a 3/16”X1.5” die.
5. Water was applied to the mash in the mixer using a “Grain Prep” auto delivery system.

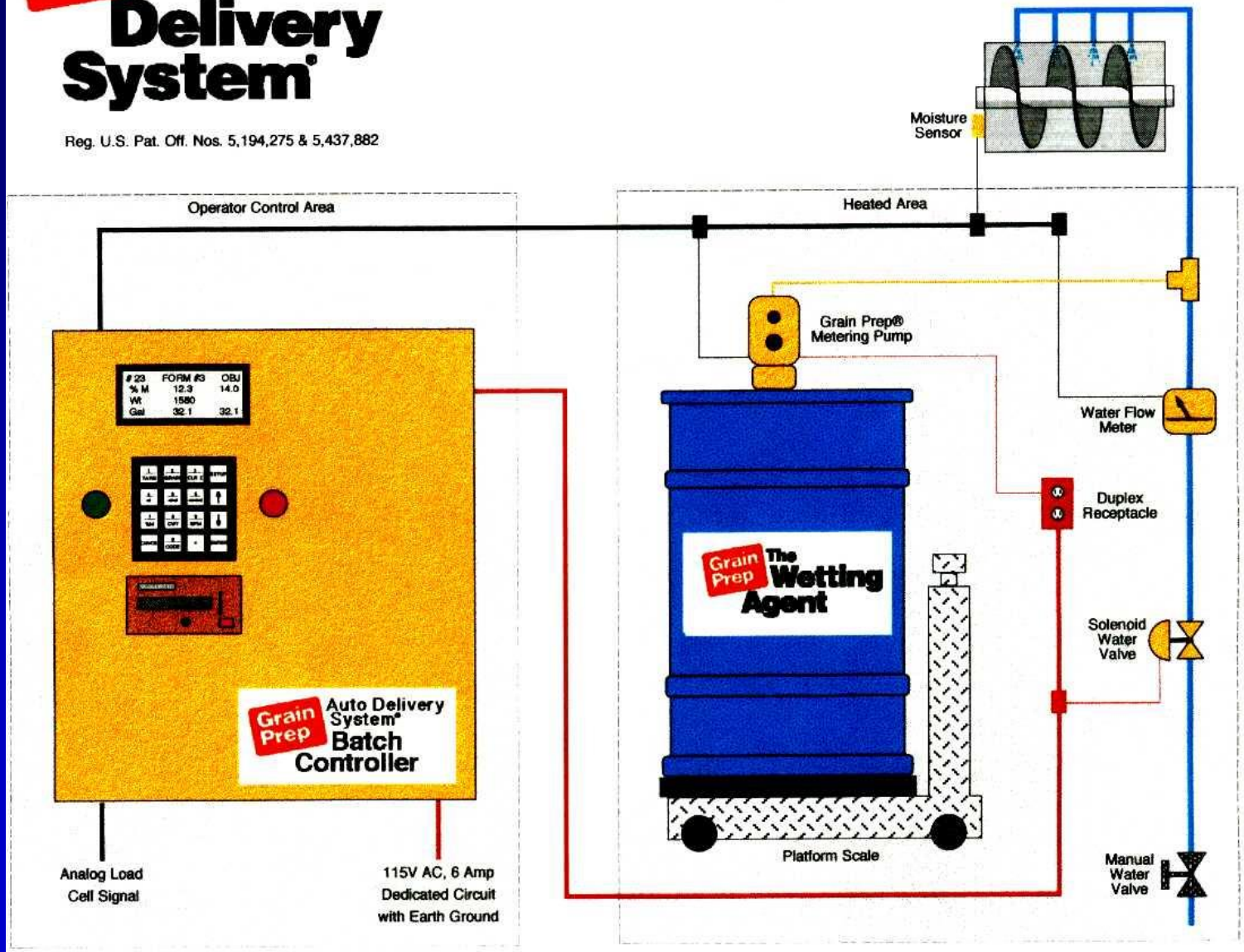
Moisture and Conditioning Results

Incoming (%)	Target (%)	Actual (%)	Conditioned (%)
11.4	12.0	12.2	15.1
11.0	13.0	13.0	15.9
10.9	14.0	14.0	16.8
10.7	14.5	14.7	17.0
11.1	15.0	15.1	18.5

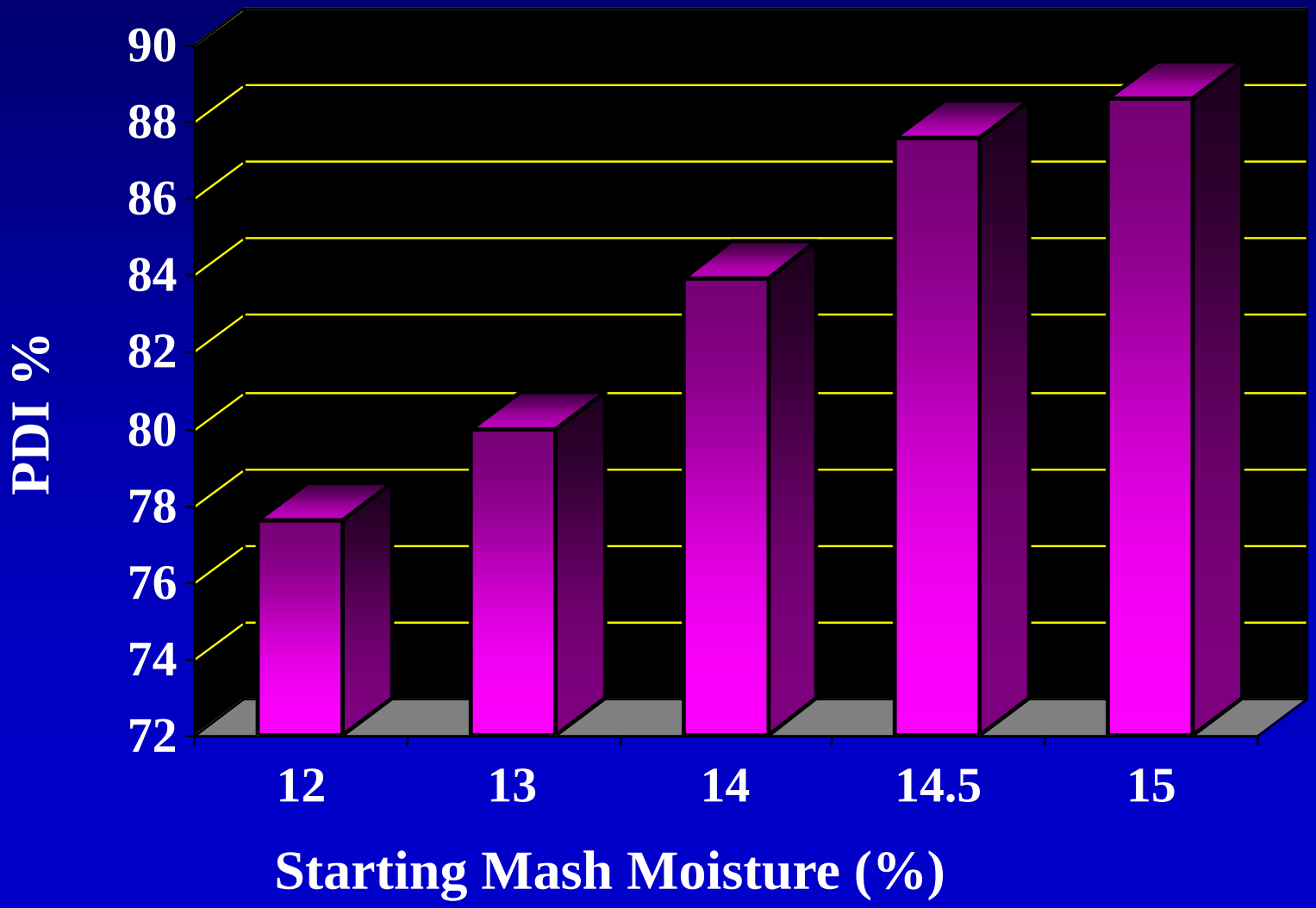
Grain Prep Auto Delivery System®

Batch Version

Reg. U.S. Pat. Off. Nos. 5,194,275 & 5,437,882



Effect of Added Moisture on Pellet Quality



Summary

1. **Conditioning has the greatest effect on pellet quality of any operation in the plant.**

2. **Steam quality and control is a major issue.**

3. **Conditioner design and operation is critical to successful pelleting operations.**

4. **Moisture control can have a significant effect on pellet quality and production rate.**