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Advancements in Gummies

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Overview

- Gummy Basics
- Advancements in Manufacturing
- Formula Advancements
- Sample Evaluations
- Cost Savings Possibilities
- *Gummies of the Future*

Why Do We Care About Gummies

- Historic growth of 3-4%
- Over $1.2 billion in sales for 2018
- Projected sales of $5 billion by 2022

Gummy Definition

- A gelatin confection with bulk sweeteners, flavor, acid and color, typically with a rubbery texture.

Gelatin

Starch

Pectin

Gelatin

- Derived from collagen
- Type A
  - Acid extraction
  - Typically pork
- Type B
  - Alkali extraction
  - Typically bovine
- Different Bloom Strengths
  - Gel strength
  - Typical range is 125-250

GELATIN BLOOM CONVERSION CHART

PERCENT GELATIN REQUIREMENT FOR EQUIVALENT BLOOM STRENGTH (AOAC)

Bloom	50	75	100	125	150	175	200	225	250	275	300	325
50	**100**	81	67	60	55	51	45	43	40	37	37	33
75	125	**100**	85	75	68	66	57	53	50	46	45	41
100	146	116	**100**	88	80	73	68	63	58	54	51	47
125	164	131	114	**100**	90	84	77	71	66	62	57	54
150	180	145	125	111	**100**	92	85	78	73	70	64	59
175	195	158	136	121	108	**100**	93	86	81	76	70	65
200	208	171	147	130	117	109	**100**	92	87	82	76	71
225	222	183	158	139	125	116	108	**100**	93	88	82	77
250	236	195	169	147	133	124	116	108	**100**	94	88	81
275	250	208	180	158	141	138	125	116	107	**100**	94	88
300	263	220	190	166	148	139	132	123	113	107	**100**	84
325	277	233	201	174	156	147	140	130	120	113	105	**100**

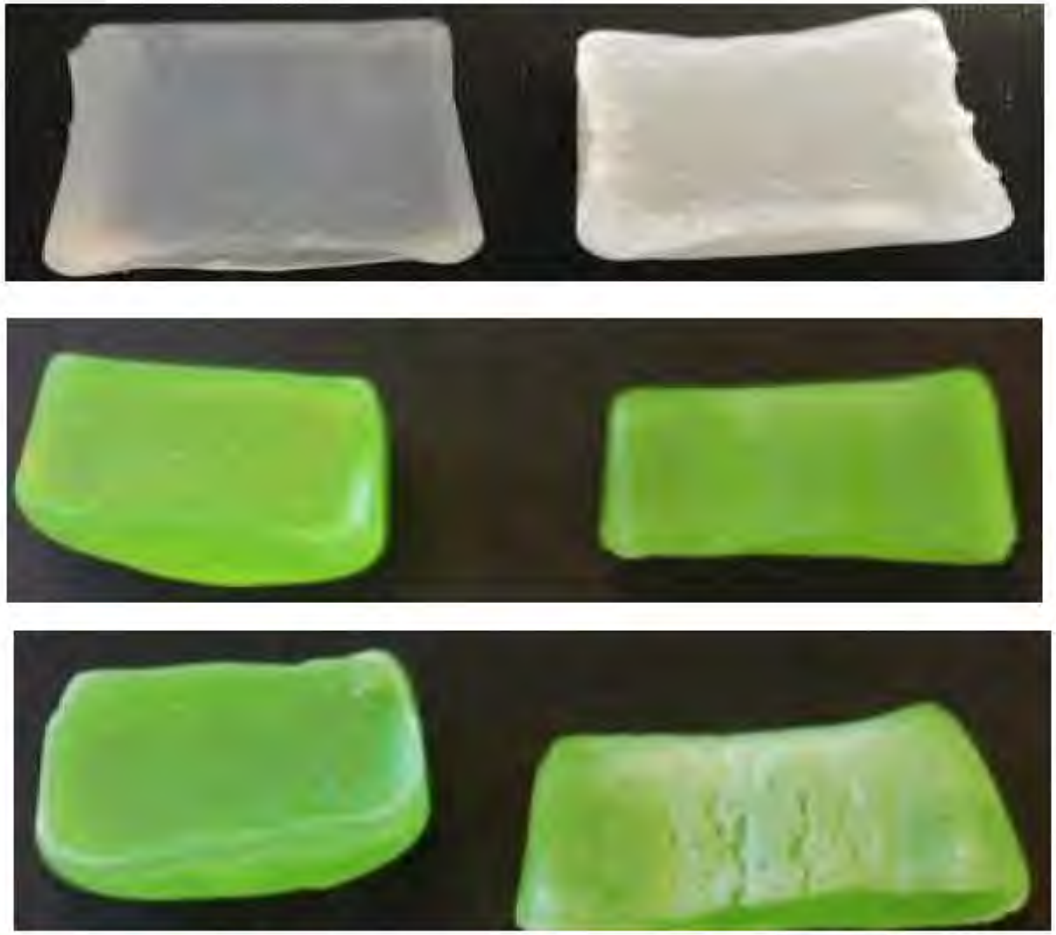
Example: If you would like to replace 100 parts of 175 bloom, you would require 108 parts of 150 bloom

General Formulas

Ingredients		Percentages				
		I.	II.	III.	IV.	V.
a.	Gelatin Type A 200 Bloom	5.00	6.00	8.00	9.00	10.00
	Water	10.00	12.00	16.00	18.00	20.00
b.	Granulated Sugar	37.00	36.50	35.50	35.00	34.50
	Corn Syrup 42 DE	47.00	46.50	45.50	45.00	44.50
	Water	12.00	12.00	12.00	12.00	12.00
c.	Citric Acid (50%)	2.00	2.00	2.00	2.00	2.00
d.	Flavor & Color	--As Desired--				

Cooking Temperature	112.0°C	114.0°C	118.0°C	120.0°C	122.0°C
	233.6°F	237.0°F	244.4°F	248.0°F	251.6°F

Sugar/Corn Syrup : Ratio Affects Crystallization



30/70
Sugar / Corn syrup

45/55
Sugar / Corn syrup

50/50
Sugar / Corn syrup

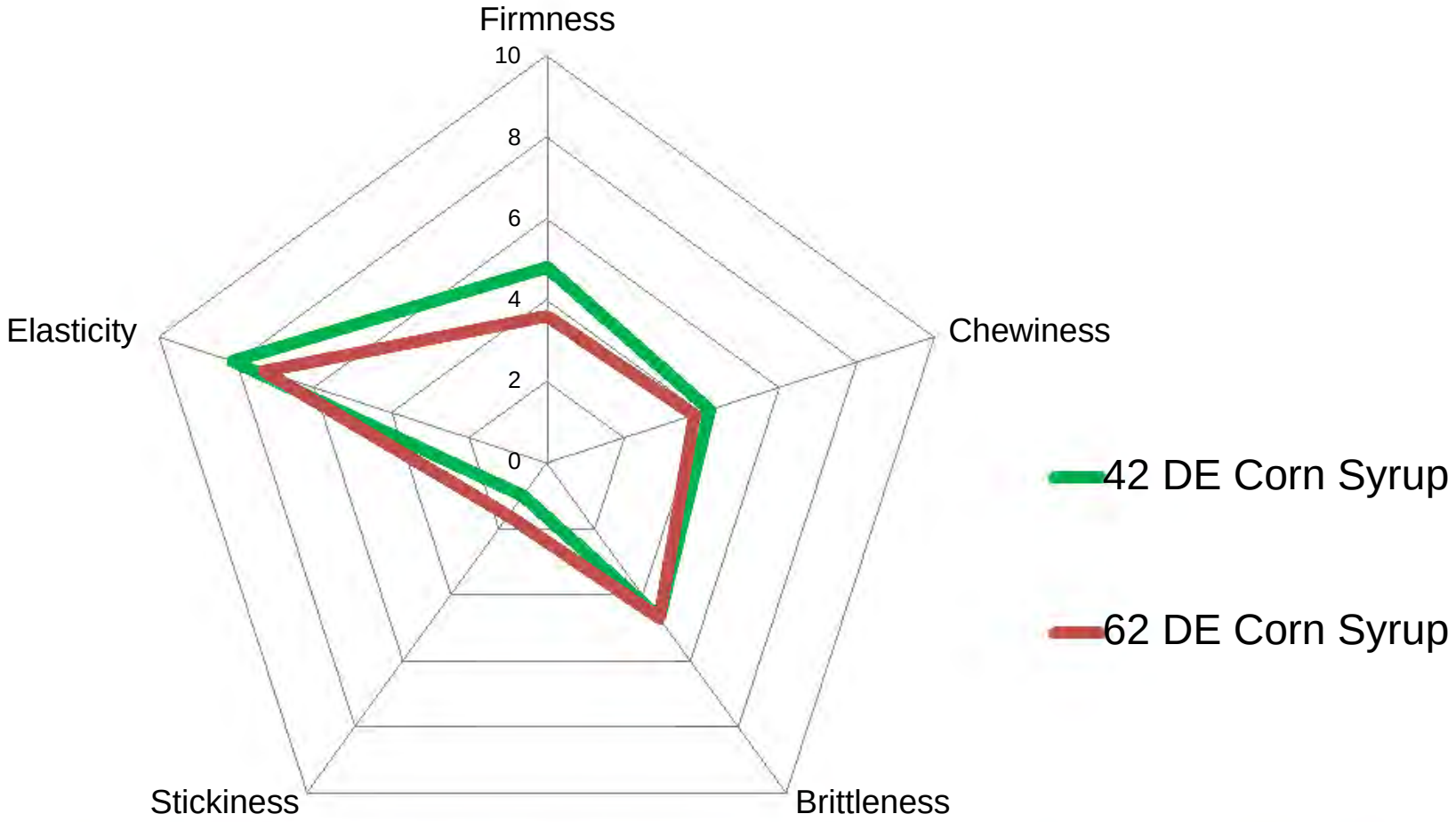
Impact of Corn Syrup DE

- Higher DE = softer
- Higher maltose = softer

- Different syrups have distinct carbohydrate profiles: *All are useable*

	43 DE Corn Syrup	42 DE Tapioca Syrup	42 DE Rice Syrup	63 DE Corn Syrup	63 DE Tapioca Syrup	60 DE Rice Syrup	65% High Maltose Corn Syrup
Dextrose	19	14	4	36	26	26	2
Maltose	14	20	36	31	32	26	66
Maltotriose	12	11	15	13	6	-	21
Higher Saccharides	55	33	23	20	13	27	11

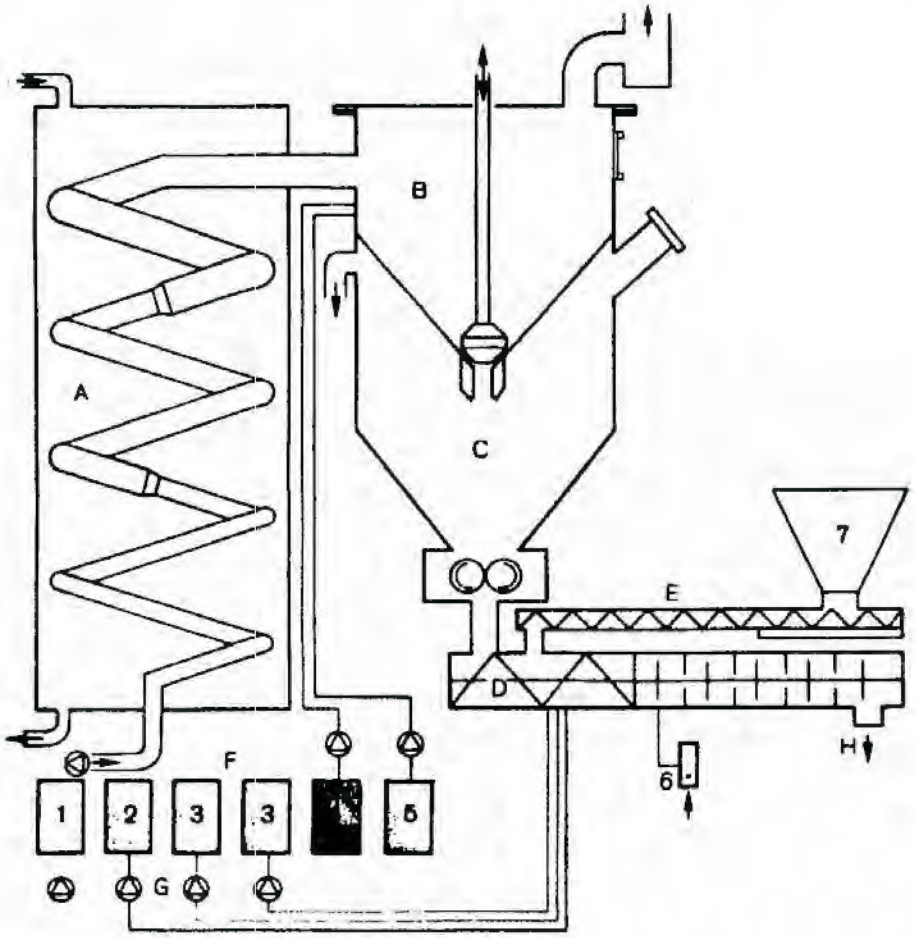
Influence of DE on Texture



Cooking: Coil

- Industry common
- Compatible with a variety of products and formulas
- Usually consists of three parts: pre cook, coil chamber, vacuum tank

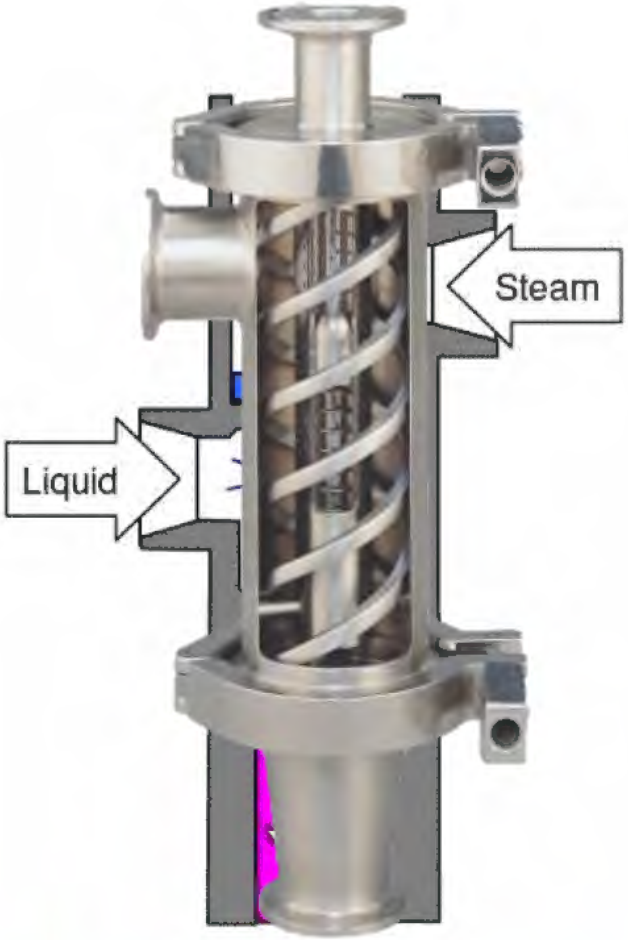
Cooking: Coil



- Indirect steam
- Closed system
- No mechanical parts inside cooker

Jet Cookers

Cooking: Jet



- Direct steam (food grade)
- Efficient
- Cost effective: less expensive than coil units
- Easy maintenance
- Capable of cooking high amylose starches

Coil vs. Jet Cooker Formula

Coil Cooker Formula	
Ingredients	Amount (%)
Gelatin 250 Bloom	5.3
Corn Syrup 42 DE	39.5
Granulated Sugar	32.5
Water (For Gelatin Solution)	10.6
Water (For Sugar Solution)	12.2
50% Citric Acid Solution	1.0-2.5
Flavor	(As Needed)
Color	(As Needed)

Jet Cooker Formula	
Ingredients	Amount (%)
Gelatin 250 Bloom	6.0
Corn Syrup 42 DE	43.9
Granulated Sugar	36.1
Water (For Gelatin Solution)	10.0
Water (For Sugar Solution)	4.0
50% Citric Acid Solution	1.0-2.5
Flavor	(As Needed)
Color	(As Needed)

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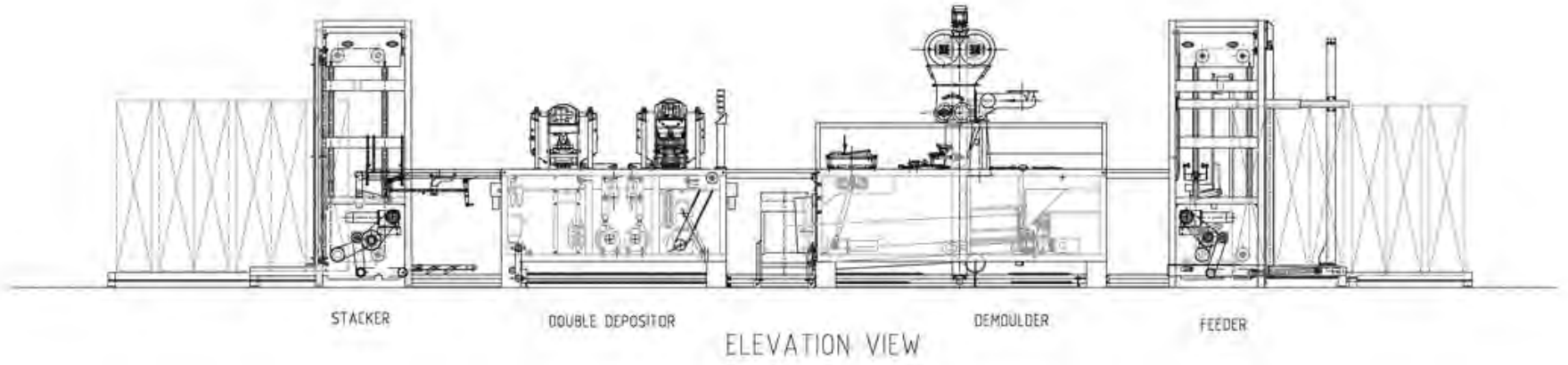
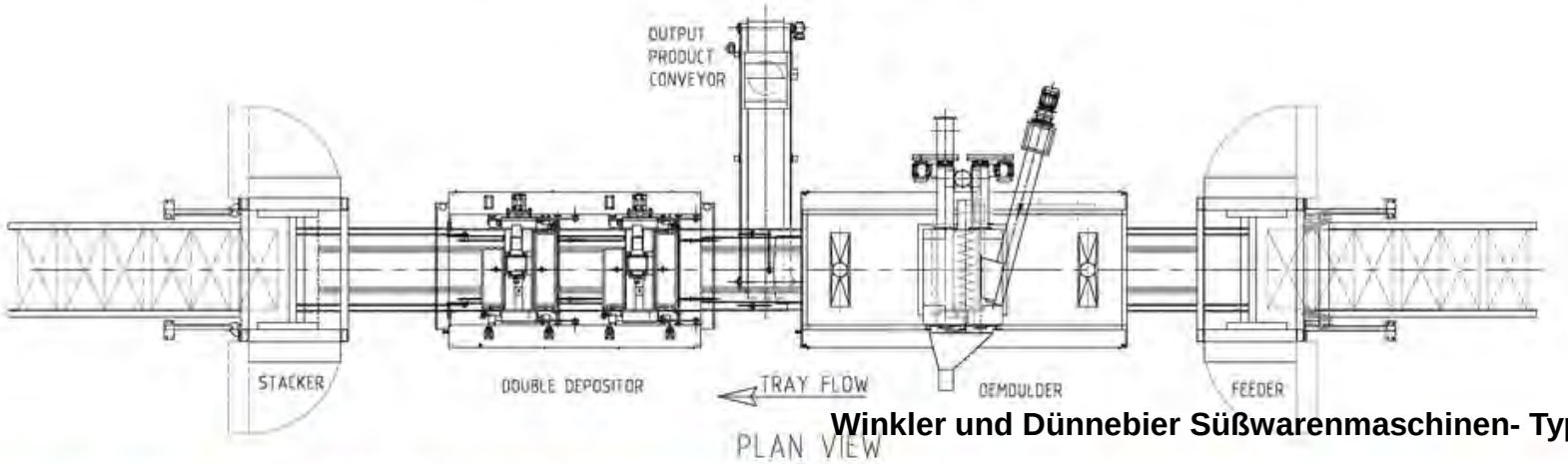
Mogul Line



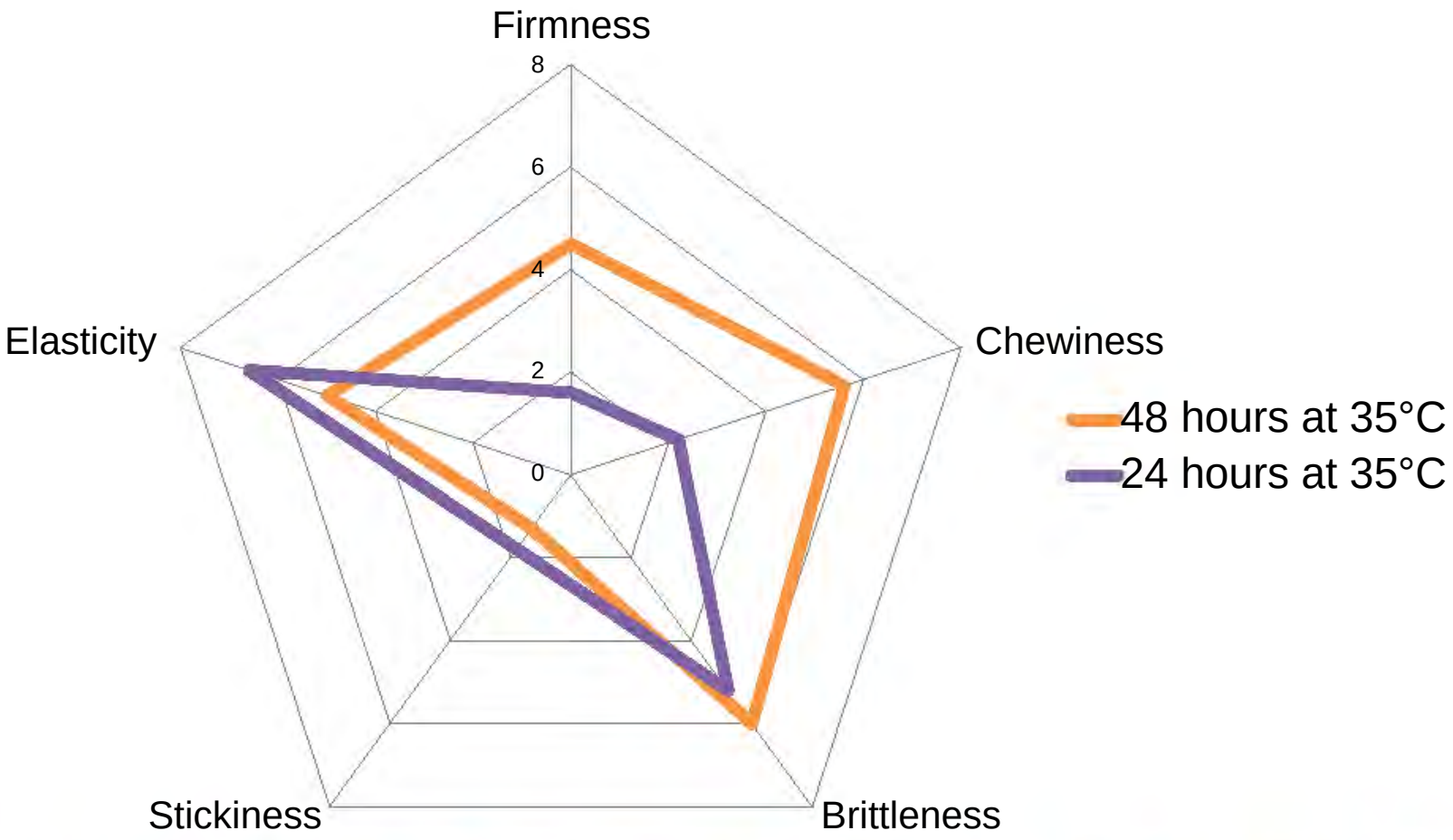


Winkler und Dünnebier Süßwarenmaschinen- Type 462

Stoving Conditions for Gelatin Gummies

- 27-35°C / 80-95°F
- RH <50%
- Starch moisture 6-7.5%
- 8-24 hours cycle time

Influence of Drying on Texture

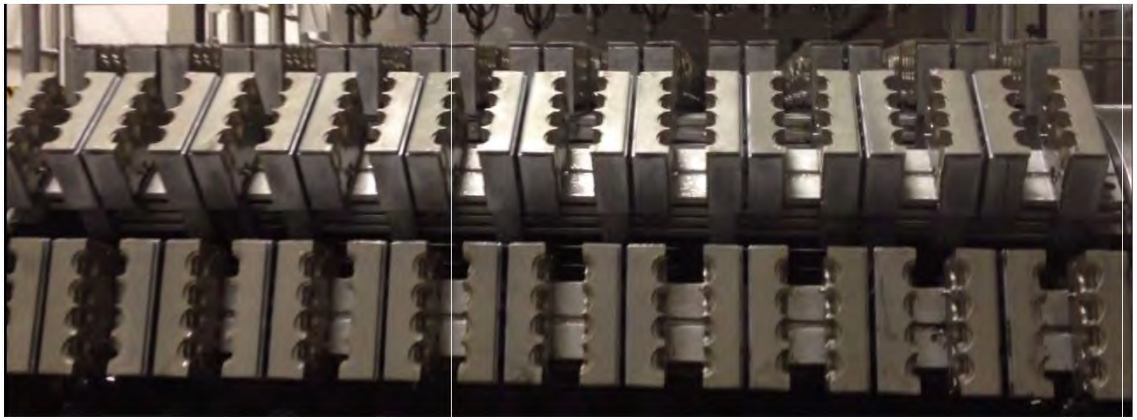


Mogul Drawbacks

- Capital investment
- Stoving is the bottleneck of the gummy process
- Possible starch contamination
- Potential for dust explosions

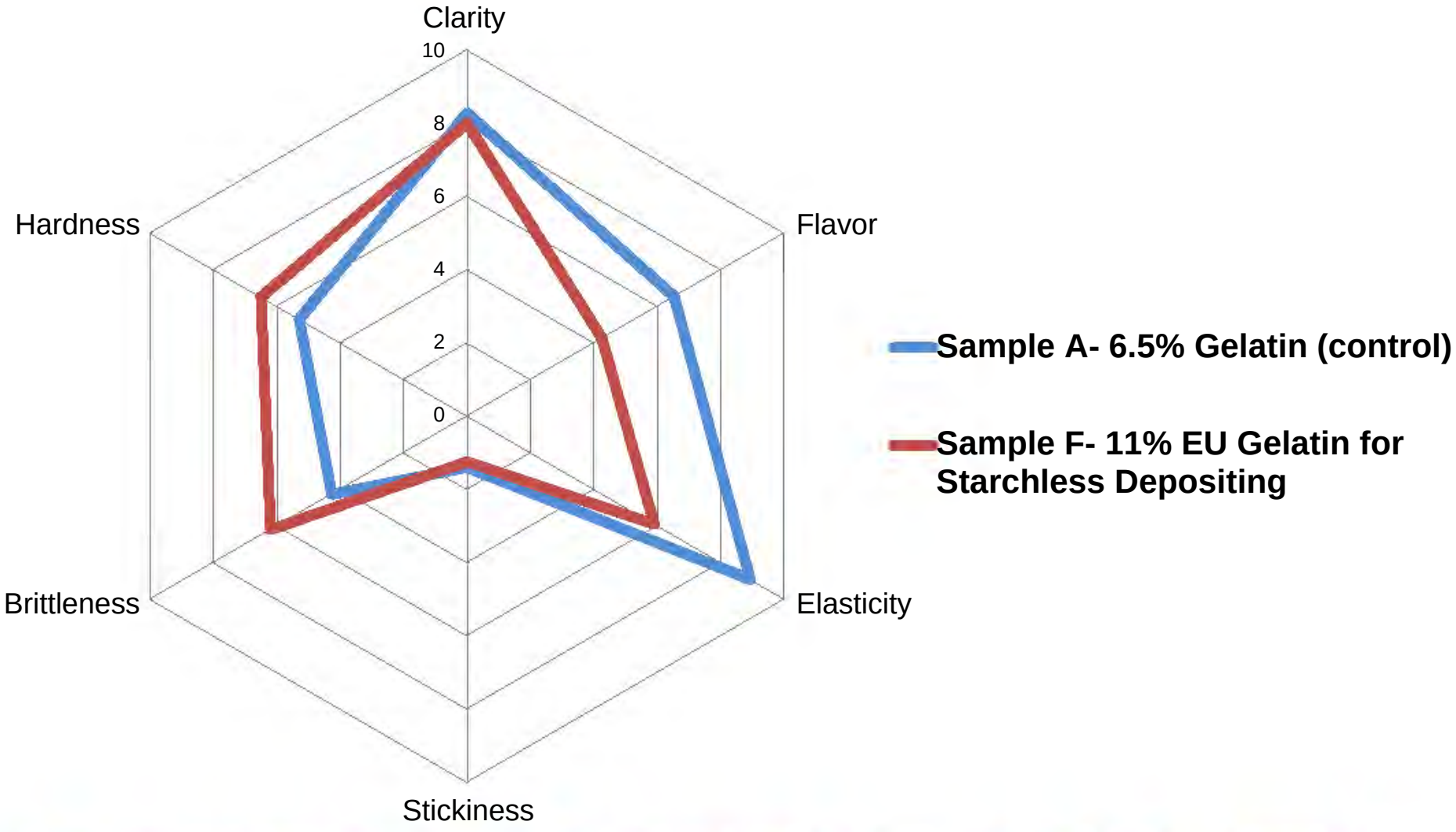
Starchless Moguls

- No starch
- 3-D molding
- Minimal cross contamination
  - Ideal for supplements or drugs



- Typically pectin
- No current “gummy” texture product being produced

Starch vs. Starchless



Use of Starch in Gelatin Gummies

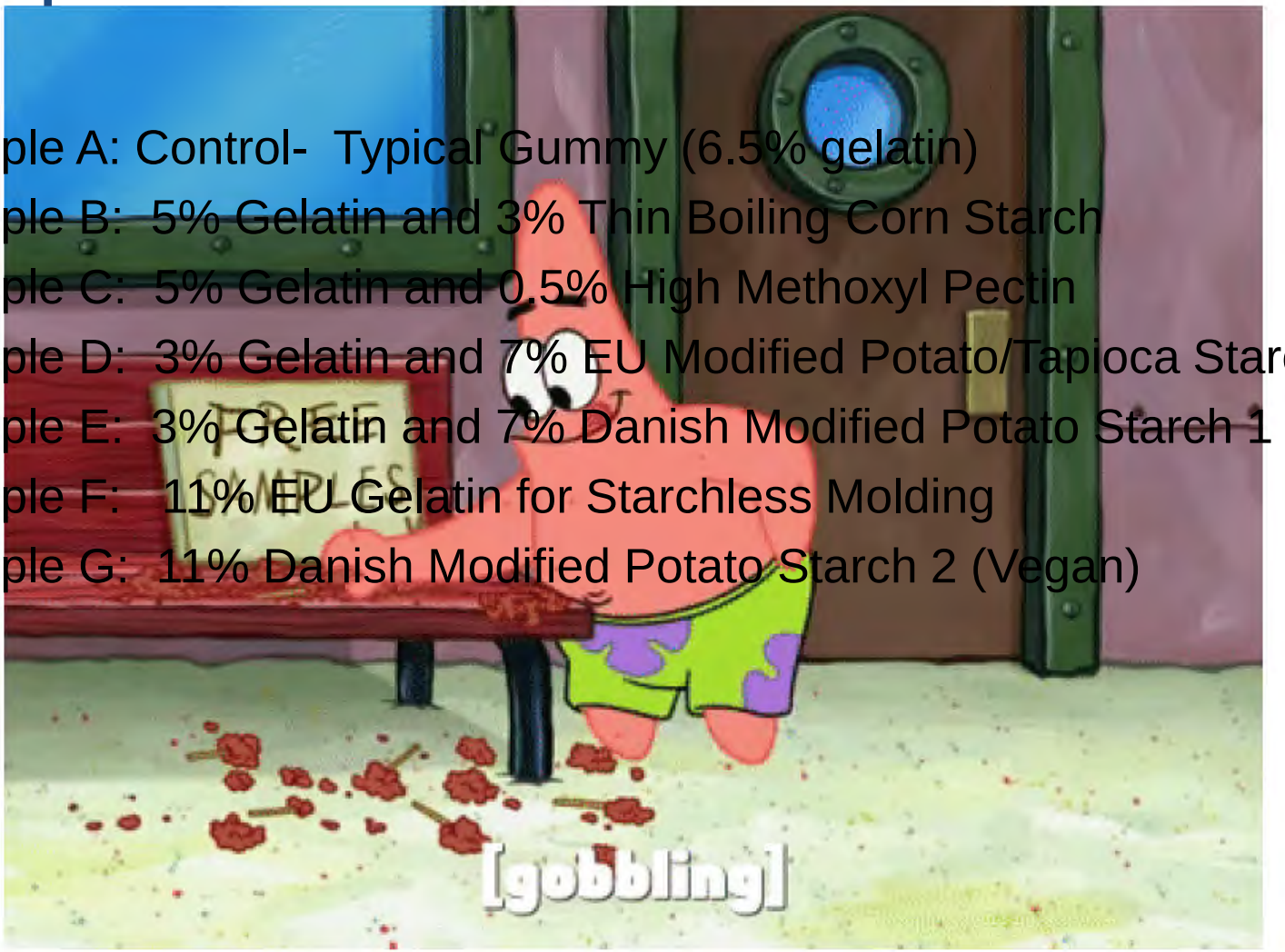
- Concept: replace a portion of gelatin with starch to reduce cost
  - Starch will stabilize product
  - Gelatin will provide texture
- Drawbacks
  - Loss of clarity
  - Loss of texture
  - Loss of taste

Starch Continued

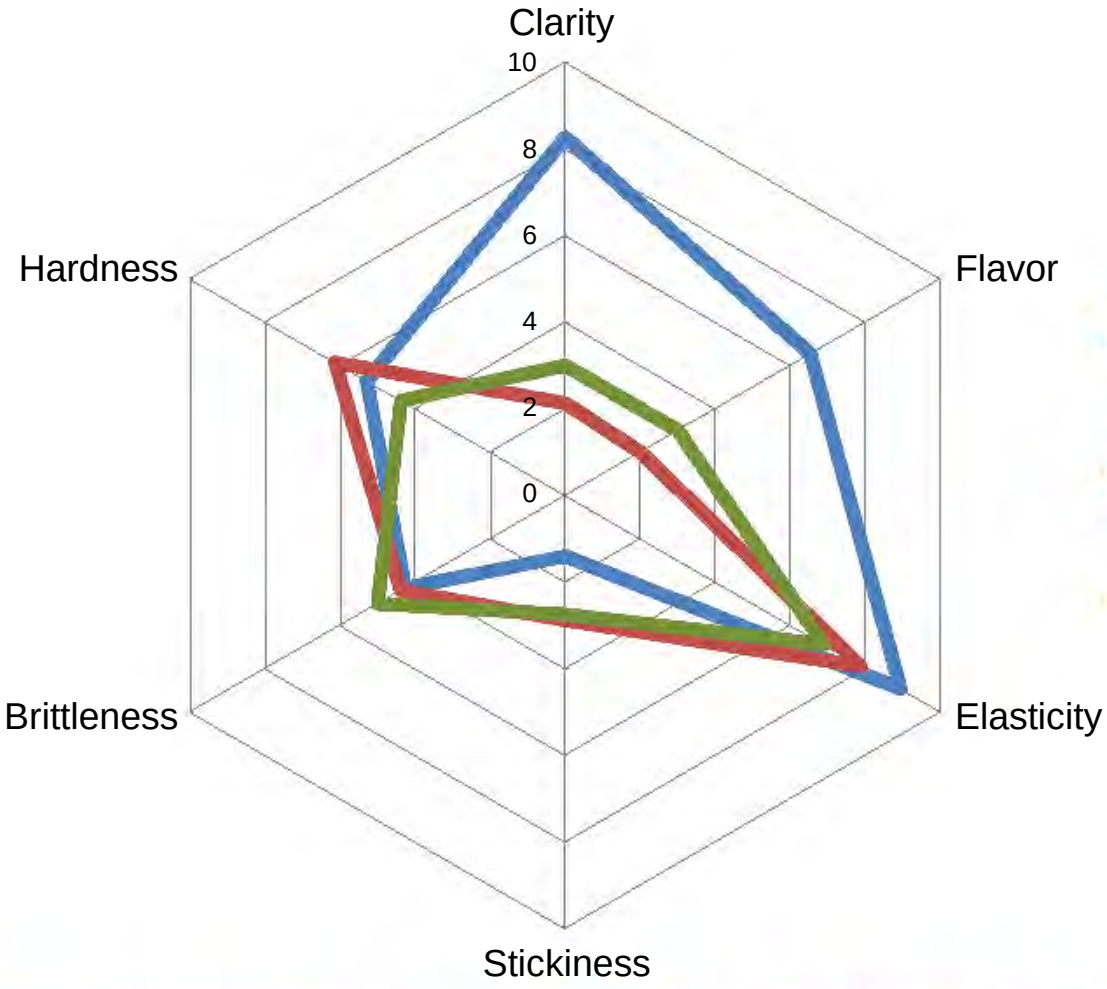
- Starches are not equal
  - Different sources
    - Corn
    - Potato
    - Wheat
  - Different modifications
    - Acid modified
    - High amylose
    - Heat treated

Samples

- Sample A: Control- Typical Gummy (6.5% gelatin)
- Sample B: 5% Gelatin and 3% Thin Boiling Corn Starch
- Sample C: 5% Gelatin and 0.5% High Methoxyl Pectin
- Sample D: 3% Gelatin and 7% EU Modified Potato/Tapioca Starch
- Sample E: 3% Gelatin and 7% Danish Modified Potato Starch 1
- Sample F: 11% EU Gelatin for Starchless Molding
- Sample G: 11% Danish Modified Potato Starch 2 (Vegan)



Industry Standards

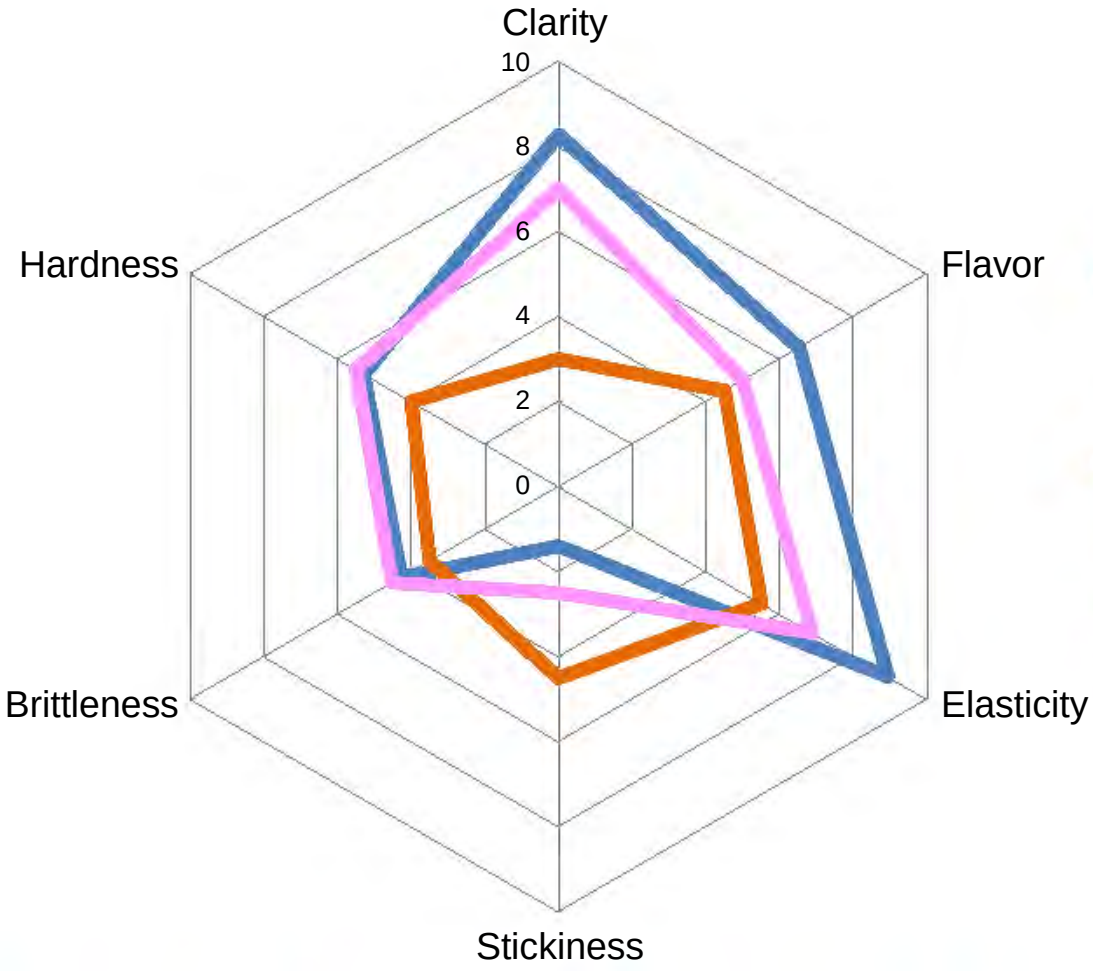


Sample A- 6.5% Gelatin (control)

Sample B- 5% Gelatin, 3% Thin Boiling Corn Starch

Sample C- 5% Gelatin, 0.5% Pectin

Potato Starch as a Gelatin Extender

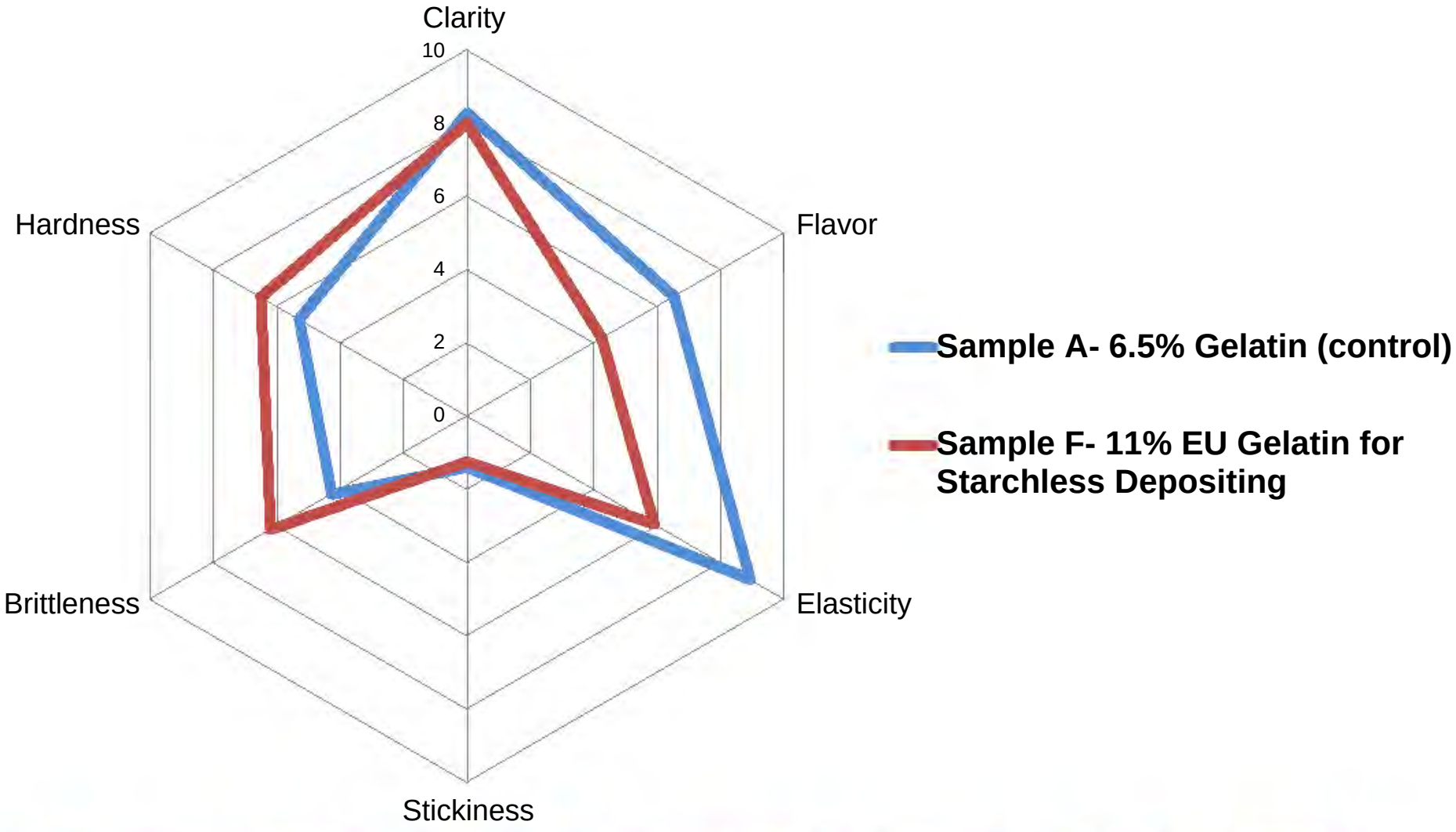


Sample A- 6.5% Gelatin (control)

Sample D- 3% Gelatin, 7% EU Modified Potato/ Tapioca Starch

Sample E- 3% Gelatin, 7% Danish Modified Potato Starch

Starch vs. Starchless



Stability

- Gelatin is thermoreversible
  - Melts at 95-100°F

Stability

6.5% Gelatin

3% Gelatin
7% EU Modified
Potato/Tapioca Starch

3% Gelatin
7% Danish Modified
Potato Starch

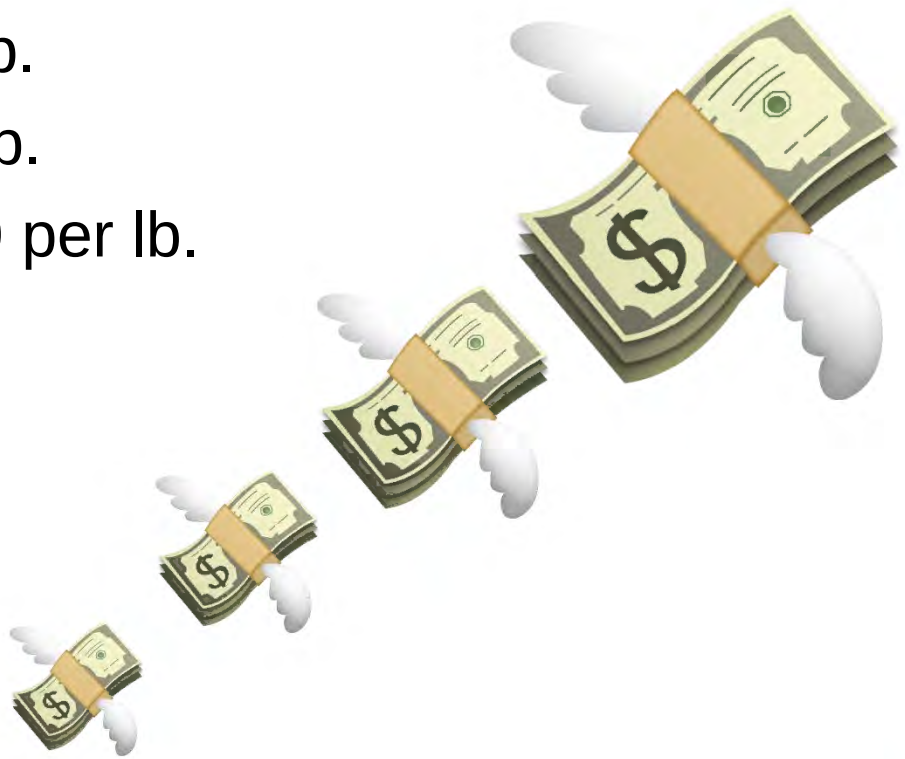
5% Gelatin, 3% Thin Boiling Starch

5% Gelatin, 0.5% Pectin

4 hours at 110°F and 20% RH

Cost Savings

- All starch formulas have cost savings
- Gelatin cost: ~ $4.00 per lb.
- Pectin cost: ~ $11.00 per lb.
- Starch cost: ~ $0.45-$0.70 per lb.

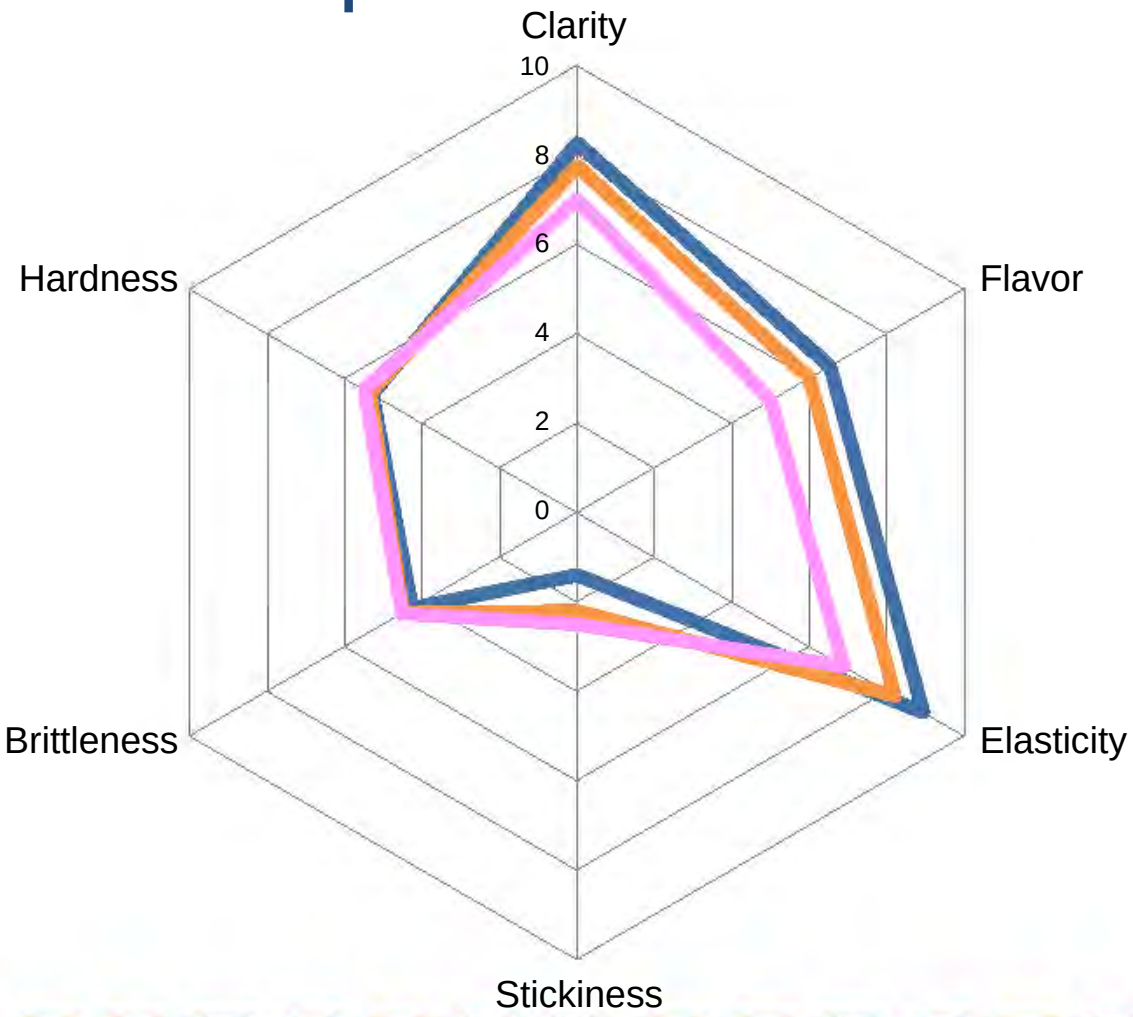


Cost Savings Using Danish Modified Potato Starch

- 6.5% gelatin vs. 3% gelatin and 7% Danish modified potato starch
  - 50+% gelatin reduction
  - ~19% cost savings

- All without changing equipment
  - Potato starch can be cooked on any type of cooker

Potato Starch as a Gelatin Extender: Replacement levels



Sample A- 6.5% Gelatin (control)

5% Gelatin, 3% Danish Modified Potato Starch 1

3% Gelatin, 7% Danish Modified Potato Starch 1

GUMMIES OF THE FUTURE

No Sugar Added Gummy

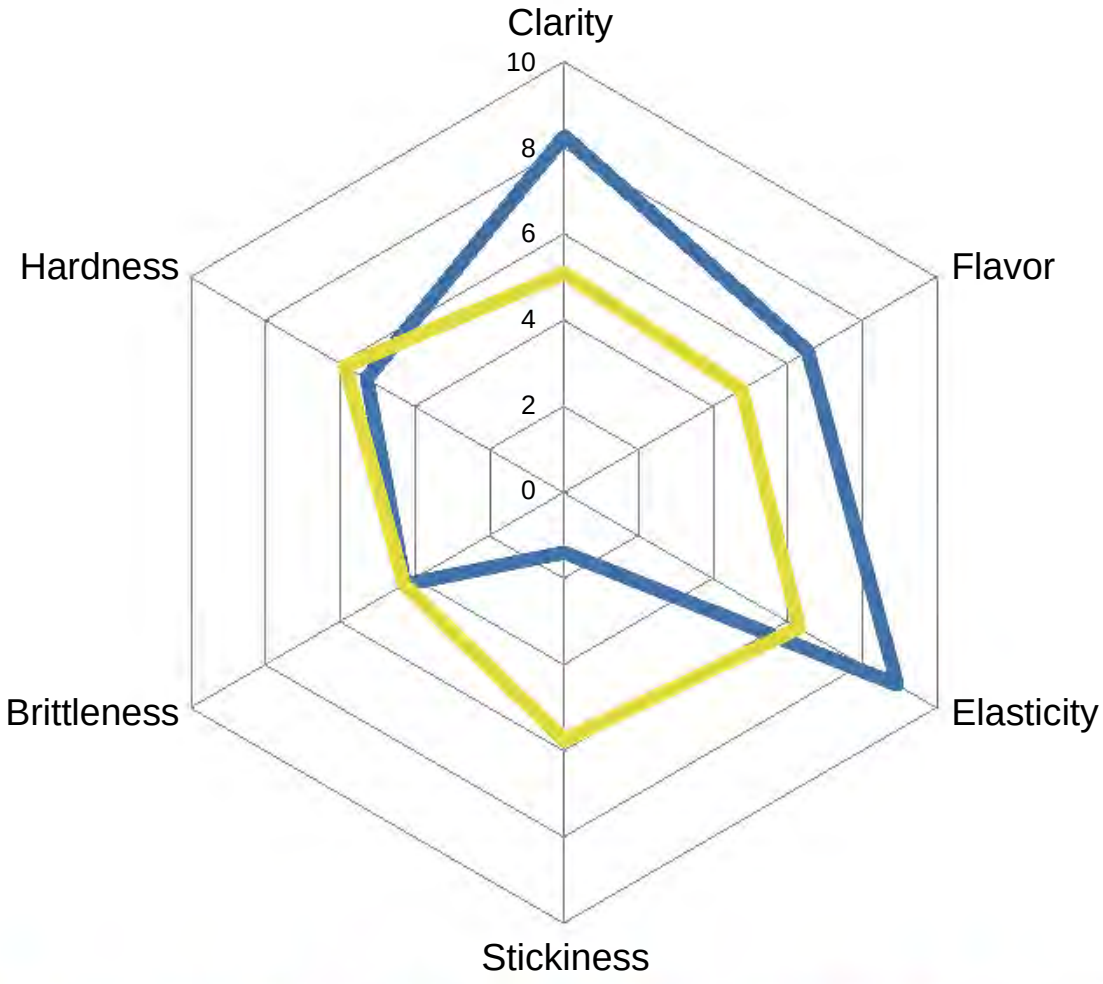
- No polyols
- Fibers and resilient starches add bulk
- Generally raise syrups viscosity
- Different functionality between fibers
- Not all fibers work for gummy applications

Vegan Gummy

Vegan Gummy Formula

Ingredients	Amount (%)
Corn Syrup 42 DE	36
Granulated Sugar	34
Water	19
Danish Modified Potato Starch 2	11
50% Citric Acid Solution	1.0-2.5
Flavor	(As Needed)
Color	(As Needed)

Vegan Gummy



Sample A- 6.5% Gelatin (control)

Vegan Gummy 11% Danish Modified Potato Starch 2

Vegan Gelatin

- Free from animal hooves, hides, bones, pigs, cows and fish
- Gelatin grown in a petri dish
  - Injecting DNA sequences of collagen into microbes
- Successful trials of vegan gelatin
- Not yet FDA approved

crueltyfree andvegan

Conclusion

- Growing industry
  - Confections
  - Supplements
- Formula versatility
- Cost saving possibilities

Thank you!!

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And the many others who assisted and guided me with this presentation!

THANK YOU FOR LISTENING!

ANY QUESTIONS?