Disc 1

Time	Main Topic	Sub-Topics
hr : min : s		
0:00:00	Introduction	Large gas-solids bed
0:01:20	Distributors	Spargers, gas into water, direction of jets
		Cintered Metal, gas into low surface tension liquid
0:02:41		Flat perforated plate grid, gas into solids
		On-set of weeping, flat plate, sparger
		Partially de-fluidized bed, flat plate grid
0:05:06		Tuyures(see also 23:35)
0:05:40		"grog" as distributor
0:06:28		FCC Regenerator flat grid, poor distribution
0:08:20	Fluidization Basics	Incipient buoyancy and bubbling tests, small column
		Slugging
0:10:45		Larger column, bed segregation
0:12:55	Jet Penetration	Single jet downward into glass beads
		Side-ways jet into heavy metal
		Angled jet into tabular alumina
0:14:27		Water into water
0:14:48		Single simulated riser feed nozzle
		Shrouded nozzle
		Erosion
0:15:38		Solids and gas into solids
0:16:06	Grid Hole designs	Single grid holes, various sizes and shapes
0:18:05	Bubble Caps	Air-Solids, Air-water, various rates
0:23:35	Tuyures	Various designs, tuyure to tuyure inter-action
		Abrupt shut down
0:25:46	Bubble Rise	Single Bubble, air-water, air-solids
0:26:51	Fluid Bed Basics	Bubble Growthe & merger, various rates and bed depths
		Maximum stable bubble diameter
0:29:16		Incipient bubbling & bubble growth, various rates and bed depths
0:32:14		Transport bed
0:33:24	Bubble Size	Gas into liquid, effect of surface tension
0:35:54		3-phase fluidization
0:38:02		Slugging and bed expansion, Maximum stable bubble diameter
0:41:08	Bed Internals	Slugging & slugging solution
		Effect on shallow and deep beds
0:47:02	Streaming Flow	Examples, necessary conditions
0:52:36	Multi-stage Beds	Downcomer, loss of seal, cab-o-sil case
		Air-water mixing
0:56:55	Flooding in 2-stage beds	% open area, "flooding" test
1:00:23	Mixing	Air bubbling through water; no internals, marbles, staging,
		pulsed gas flow,
		Dye into large two phase bed
1:02:23		Deep, compartmentalized air/solids bed, additional mixing tests,
		mixing along grid
1:07:26		2-D staged bed with downcomers, air-solids, air-water

1:08:35		Large fluid bed mixing
1:09:27		Water into water
1:09:45	Draft Tubes	Various designs
1:10:30	Flow out of Bin	Arching/Bridging
1:11:30		Angle of Internal Friction & Repose
		Angle of Slide
		Water flow/shear
1:14:54	Difficult Fluidization;	
	Innovative Grids	rat-holing, agglomeration, grid innovations, directional grids,
		full draining grids, all solids active,
1:24:56	Bubble caps	Bubble Cap ball/check valve distributor, erosion issues
1:26:33	Standpipes	Standpipe entry designs, aeration requirements, angled standpipes,
		over-aeration, bubble venting, vibration, horizontal dense phase
(1:32:12)		
	Disc 2	
0:00:00	Standpipes	Standpipe entry designs, aeration requirements, angled standpipes,
		over-aeration, bubble venting, vibration, horizontal dense phase
0:05:11		Horizontal conveying, unit to unit transfer
0:07:21	Standpipe to Riser Configurations	U-Bend, j-Bend, y-Bend, Seal pot
0:12:36		"Sugar Scoop" designs
0:17:55	Pneumatic Conveying	Angled lines, curved lines, feed nozzles, refluxing, Nozzle design,
		Slug flow, Draft tube(air-liquid)
0:27:33	Riser Terminations(FCC Risers)	History of designs…simple cap to rough-cuts to "Arms"
		positive and negative pressure rough-cuts
0:35:52	Riser Cap Blow-off	Forces on riser cap
0:37:42	Regenerator Plenums	Solids accumulation, baffles/deflectors
0:40:13	FCC Regenerator designs	Gas distribution, standpipe to bed designs, mixing
0:43:33	Cyclonic Separators	Shave-off baffle, distribution to cyclone clusters
		air-water chamber, Inlet profile, horizontal "3rd stage"
0:50:37		Spread Angle at inlet, Spread angle correlation
0:53:05		Effective Natural Vortex Length demonstrations
0:58:49		Vortex length and spread angle tests at high loading, additional
		vortex demonstrations
1:06:29	Submerged Diplegs	
1:08:24	Trickle Valves	Demo
1:09:02		Trickle valve operation map,
1:09:30		Trickle Valves in operation
1:21:40		Counter-weighted valves
1:25:18	Gas-Liquid Separation	various methods
1:27:24		Gas/liquid separation by cyclonic device
1:30:02	Entrainment Suppression	Demo
1:32:38	Strippers(CC Gas-solids)	Disc and Donut designs, capacity considerations,
		Modified Disc and Donut designs, alternate designs

	1:40:16		Flooding Considerations, alternate designs
			Which Stripper design functions most efficiently?
	1:47:18	Mechanical Conveying	Demo of specific project
	1:48:40	FCC Demo Models	
	1:49:35	Water flow over a weir	
	1:50:44	Final credits	