

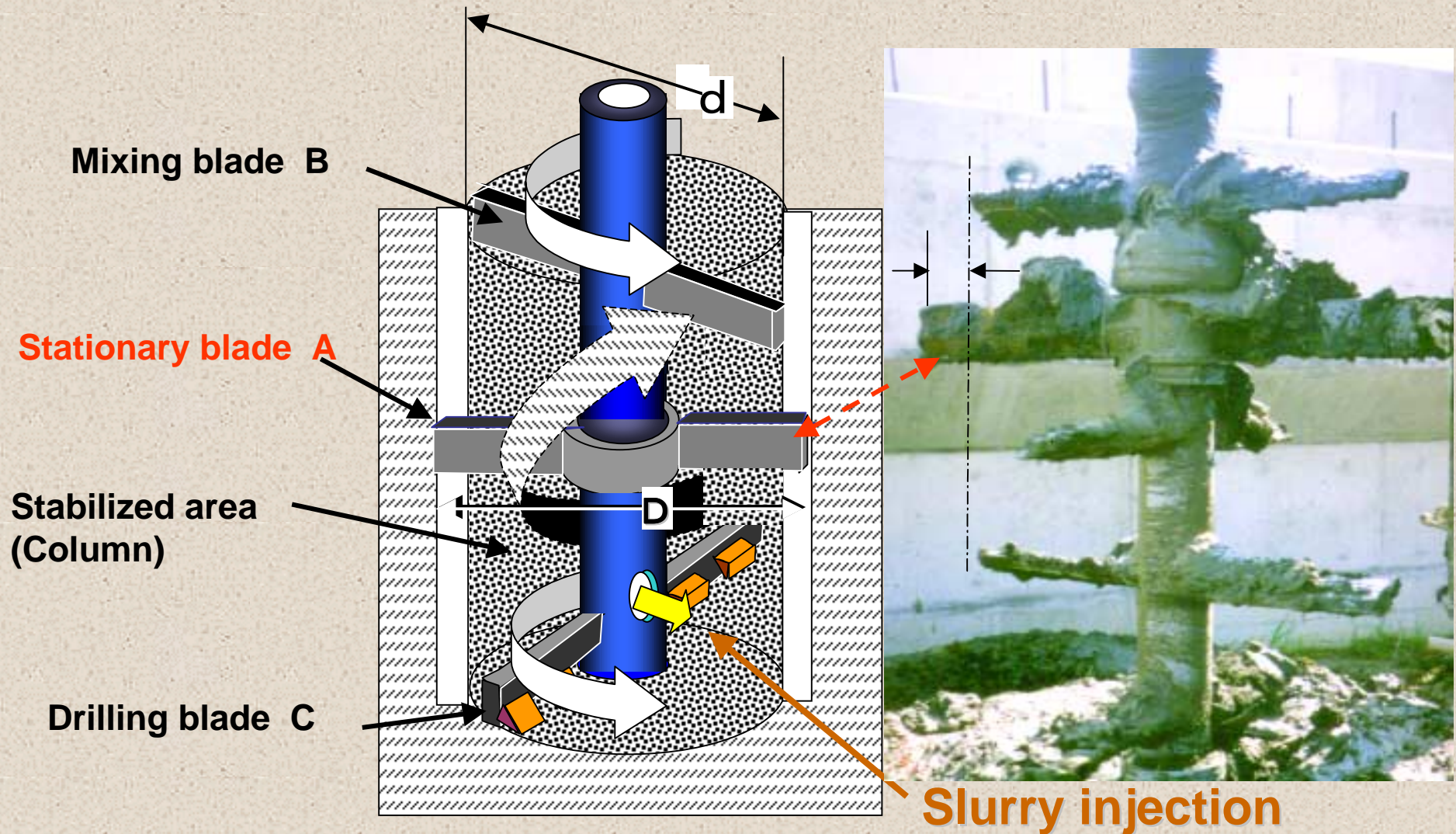
Soil stabilization techniques

**Mechanical mixing of
Cement slurry with soil in place**

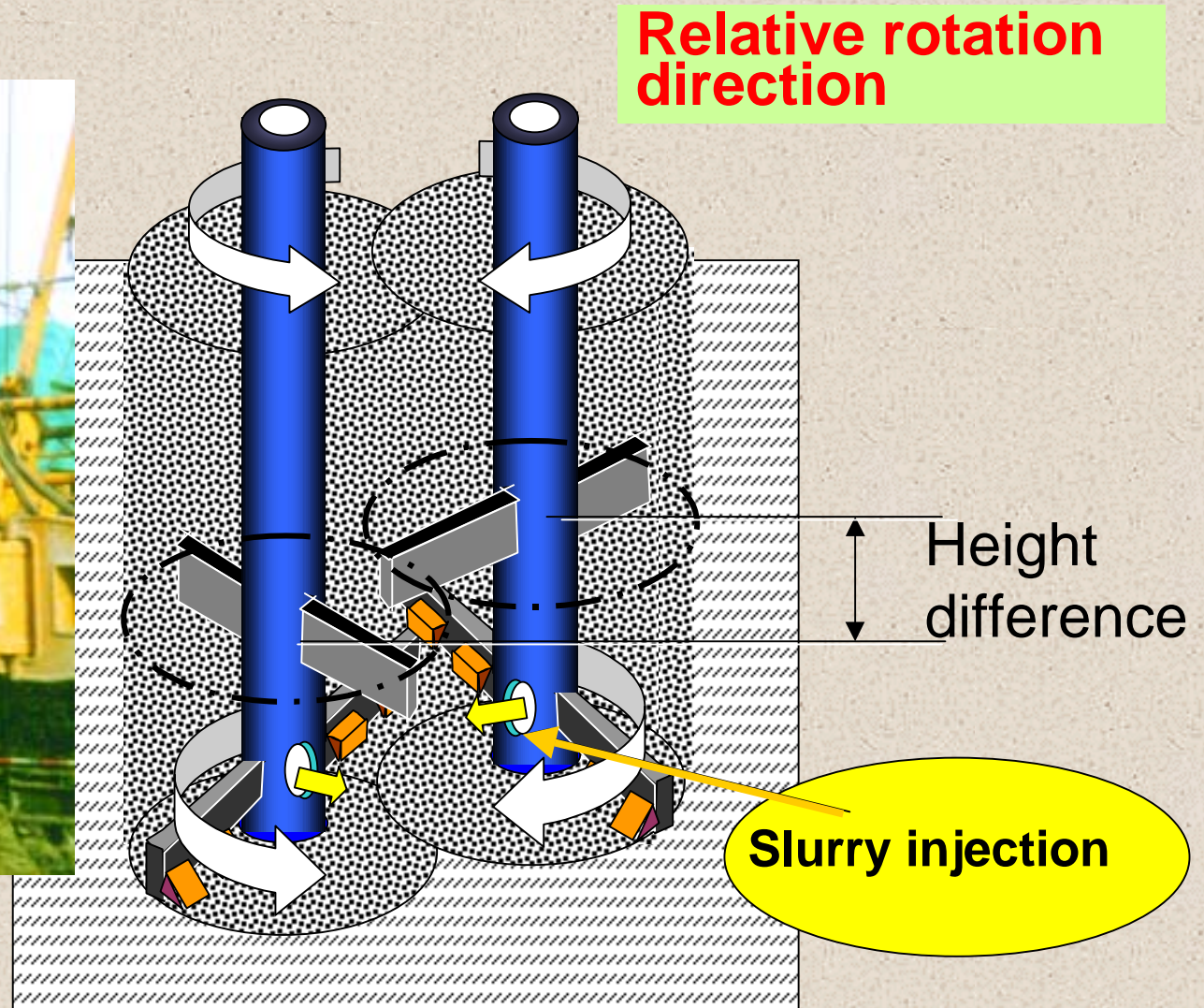
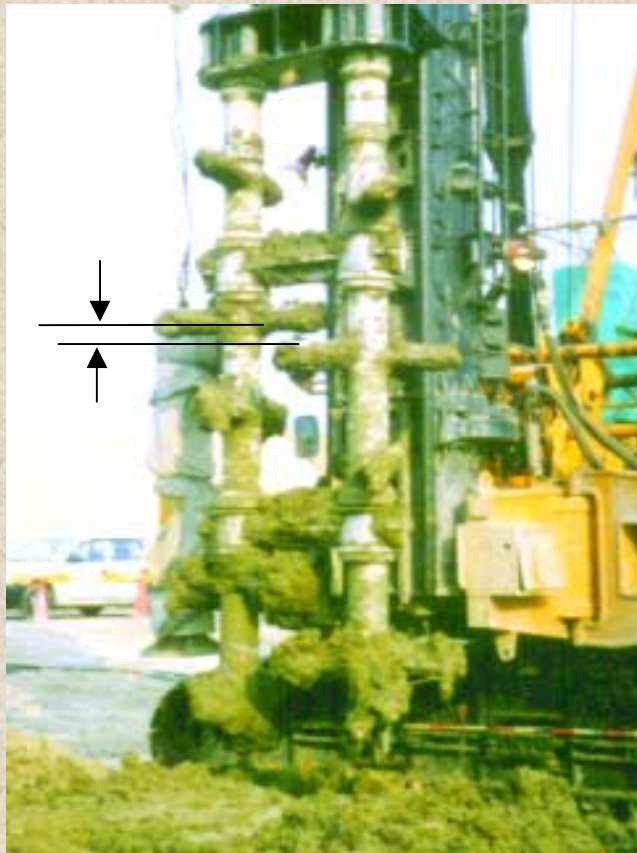
NIPPON SHARYO

TENO-COLUMN

Single rod with stationary blade



Twin-shaft mixing



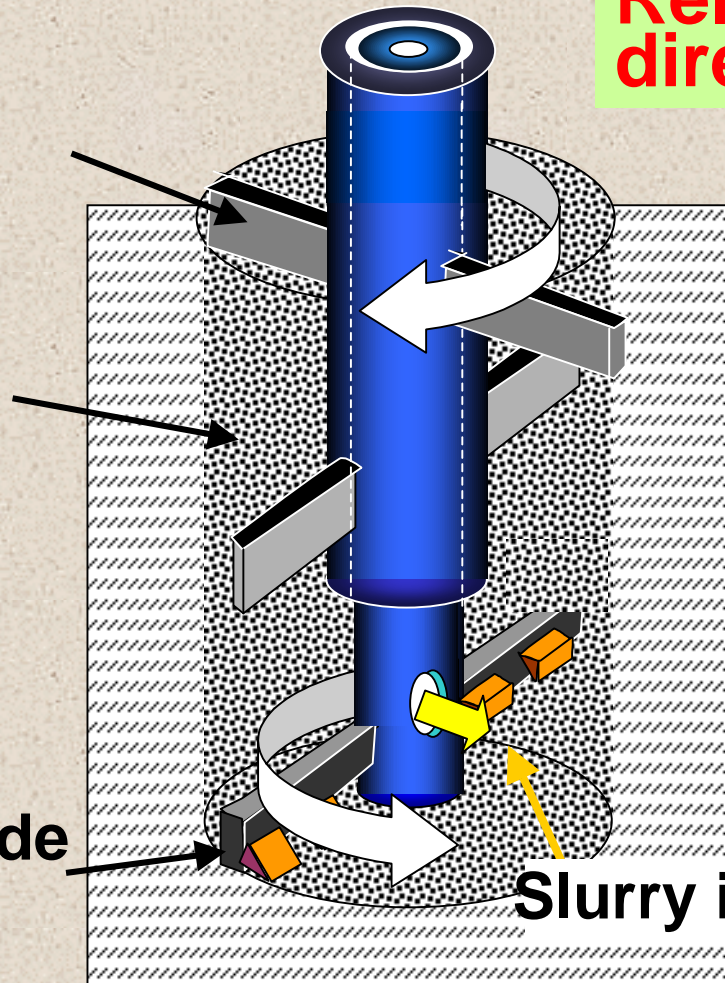
Co-axial shaft mixing

Mixing blade

Stabilized area

Drilling blade

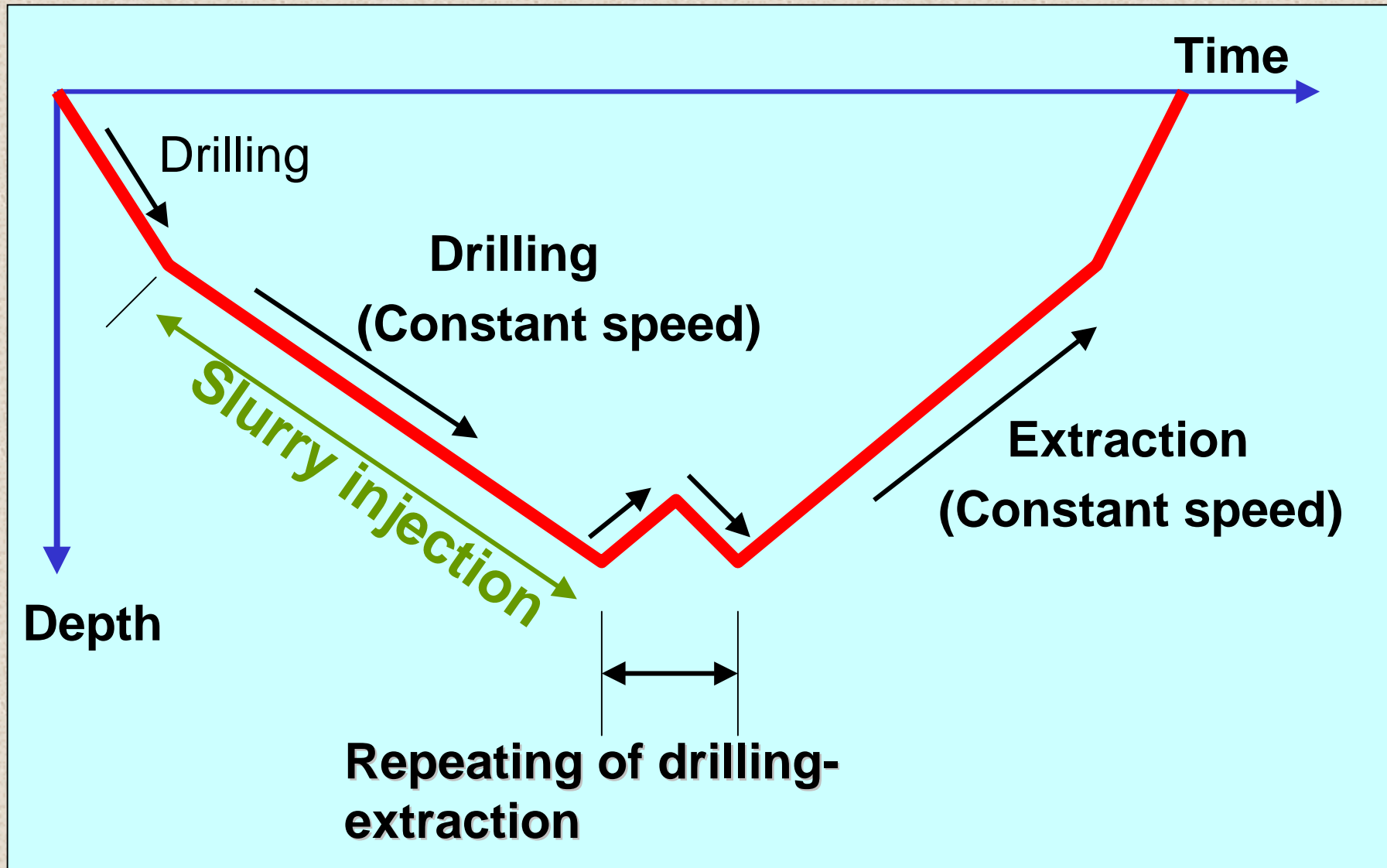
Co-axial shaft :
Relative rotation
direction



Slurry injection



Operation Process of Soil Stabilization



Standard elevation speed of mixing/drilling rod

	Shaft drilling over column	Stabilized column	
	Drive/extraction speed (m/min.)	Drive speed (m/min.)	Extraction speed (m/min.)
Standard	0 ~ 3.0	0.5	1.0
Rough stabilization	0 ~ 3.0	0.5 ~ 1.5	1.0~2.0

Specification of Stabilizer

Kind of Stabilizer	Specific gravity g/cm ³	Chemical composition						
		SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	SO ₃	MgO	Total
Stabilizer A (Common soil)	3.02	18.8	4.5	2.6	60.3	7.5	1.4	95.1
Stabilizer B (Organic soil)	2.95	17.1	3.8	2.4	60.0	9.8	1.3	94.4
Portland cement	3.26	21.3	5.1	3.0	64.2	2.0	1.5	96.9

Mixing ratio of stabilizer & average strength

Soil	Amount of stabilizer	Water/stabilizer ratio	Average strength at site
	C (kgf/cm³)	W/C %	q_{uf} (kgf/cm²)
Sandy soil	150~250	60~120	15~40
Clayey soil	200~300	60~100	10~30
Loam	200~350	60~80	10~30
Organic soil	250~350	60~80	8~20
High organic	300~450	60~80	5~10