Key Comparison in Liquid Hydrocarbon Flow
(APMP.M.FF-K2P, identifier yet to be determined)

Ryouji Doihara

Liquid Flow Standards Group,
Research Institute for Engineering Measurement,
NMIJ, AIST

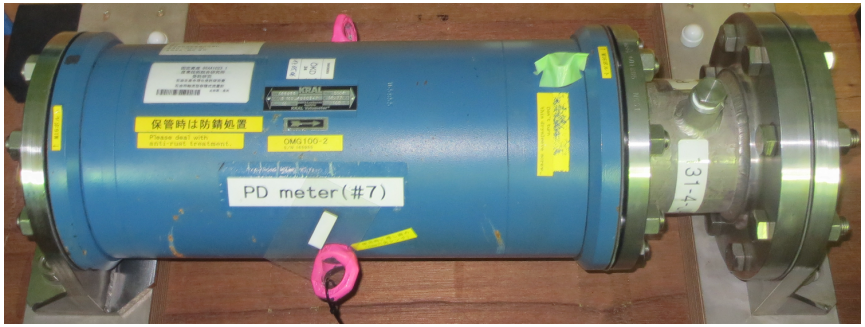
- This key comparison was proposed to link the key comparison reference value (KCRV) of CCM.FF-K2.2015
- Participants
  - NMIJ, Japan (pilot, link laboratory)
  - CMS, Chinese Taipei (link laboratory)
  - NMIA, Australia (link laboratory)
  - KRISS, Korea
- Transfer standard
  - PD screw type flow meter (4 inch, KRAL)
- Schedule (Start was postponed)
  - Participants request
  - Delay of TS uncertainty evaluation
- Protocol
  - Draft protocol is under discussion among participants

History of K2 (KC for liquid hydrocarbon flow)

Period	Identifier	Participants	Transfer Standards	Linkage
2005~2008	CCM.FF-K2	UK (NEL), Sweden (SP), Netherlands (NMi), Denmark (FORCE), Japan (NMIJ), Chinese Taipei (CMS)	1) Turbine 2) PD screw meter (4 inch, KRAL)	
2009~2011	APMP.FF-K2	Chinese Taipei (CMS), Vietnam (VMI)	PD screw meter (4 inch, KRAL)	Linked to CCM.FF-K2
2011~ (Final report pending)	CCM.FF-K2.2011	Netherlands (VSL), Austria (BEV), Chinese Taipei (CMS), Germany (PTB), Japan (NMIJ), Korea (KRISS), UK (TUV-NEL), USA (NIST)	Two Coriolis meters (Micro Motion, Krohne)	
2011~2016	APMP.M.FF-K2.a	Japan (NMIJ), Chinese Taipei (CMS), Australia (NMIA)	PD screw meter (6 inch, KRAL)	Linked to CCM.FF-K2
2011~2016	CCM.FF-K2.2015	Japan (NMIJ), Austria (BEV), Mexico (CENAM), Chinese Taipei (CMS), France (LNE-TRAPIL), UK (NEL), Australia (NMIA)	PD screw meter (6 inch, KRAL)	
2020~	APMP.M.FF-K2P (to be proposed)	Pilot Lab: NMIJ, KRISS, NMIA, CMS	PD screw meter (4 inch, KRAL). It is the same type but different flow meter from APMP.FF.-K2(2009).	To be linked to CCM.FF-K2.2015

Transfer Standard and Container

- Positive displacement meter (4” Kral meter)
  - Max. flowrate : 180 m^3/h
  - 4 inch ANSI 150 : 450 mm long (meter body)



Planned Test Condition

- Liquid : Clean hydrocarbons (Kerosene, Light oil etc.)
- Flowrate : 60 ~ 150 m^3/h
- Viscosity range : 1.5 to 7.0 mm^2/s (cSt) @ test condition
- Liquid temperature : 20 ºC to 30 ºC
- Pressure : 1 to 6 bar
  - > 1 bar downstream of the package
- Cardinal point
  - flowrate at Re=100,000 and 150,000 (D=0.1 m)

Re	KRISS	NMIJ		CMS	NMIA	
	3.0 cSt (Light oil)	1.7 cSt (Kerosene, 20 ºC)	5.6 cSt (Light oil, 20 ºC)	4.4 cSt (Solvent oil)	1.6 cSt (Nopar12)	5.2 cSt (D130)
100,000	85 m^3/h	47 m^3/h	162 m^3/h	124 m^3/h	-	147 m^3/h
150,000	127 m^3/h	70 m^3/h	-	-	68 m^3/h	-

Proposed schedule

- Nov. 2020 Draft protocol
- Jan. 2021 Protocol agreed between participants
- Apr. 2021 Comparison starts

  --
- Dec 2021 Comparison finishes
- Feb 2022 Discussion of Draft A